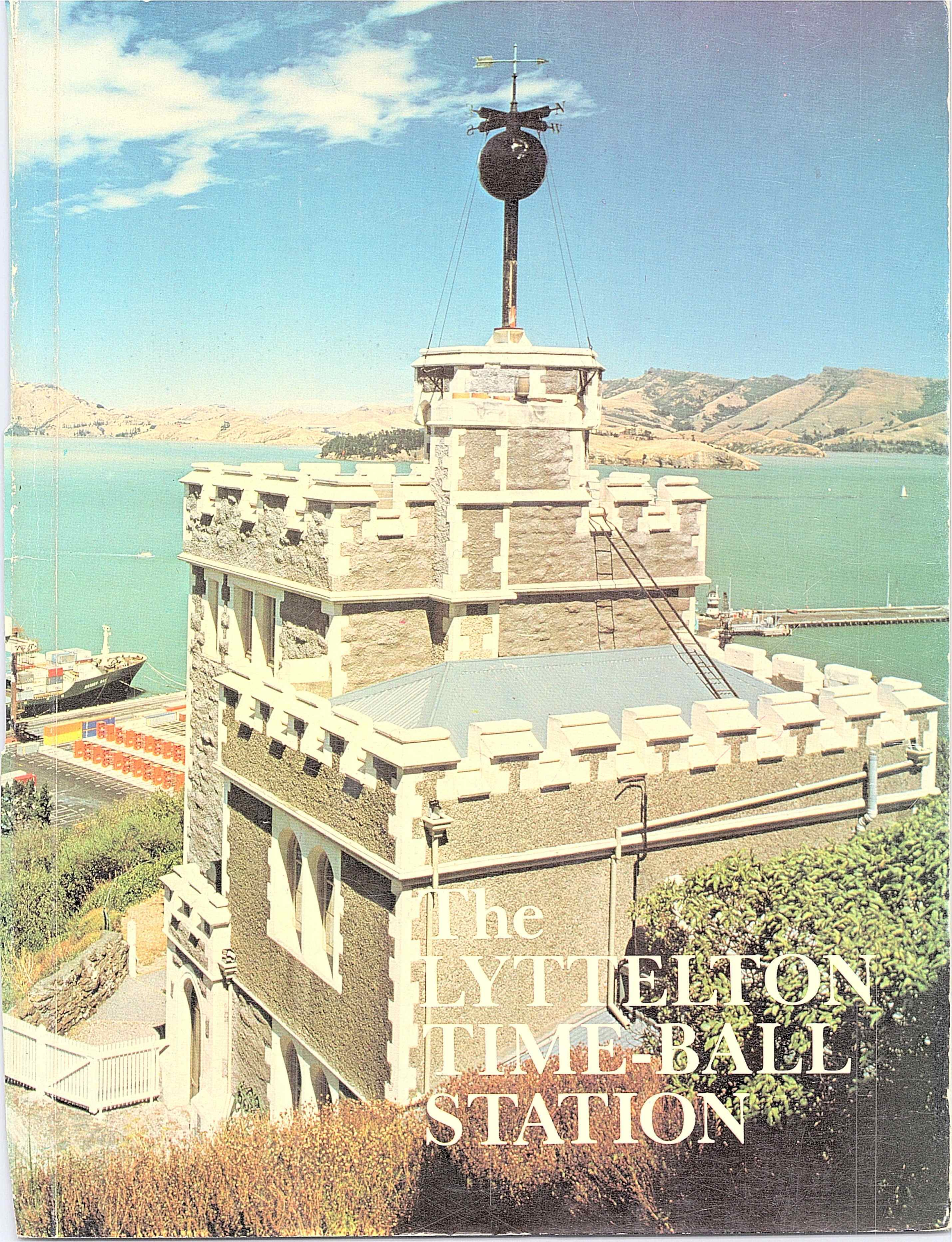
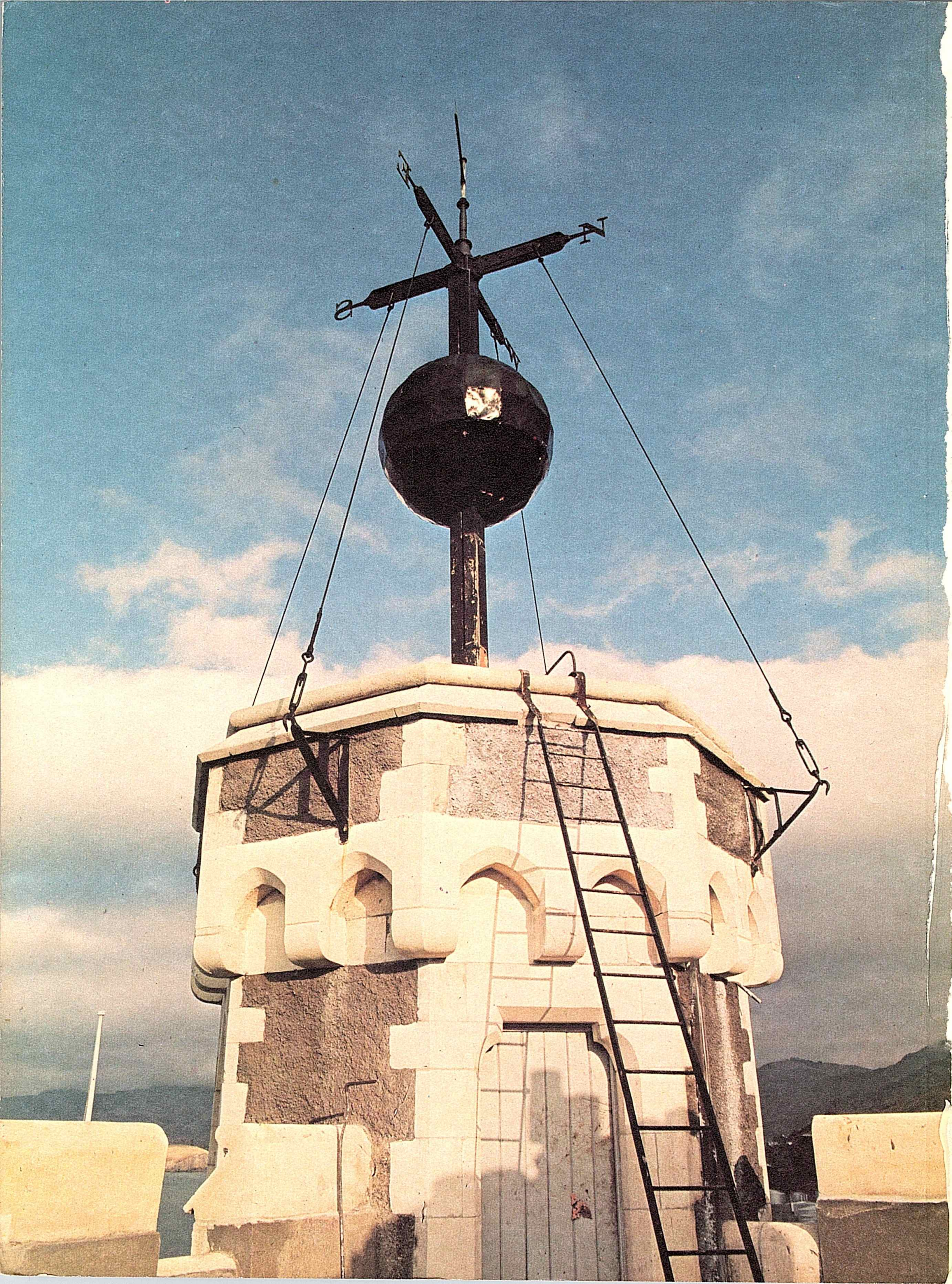
The LYTTELTON TIME-BALL STATION

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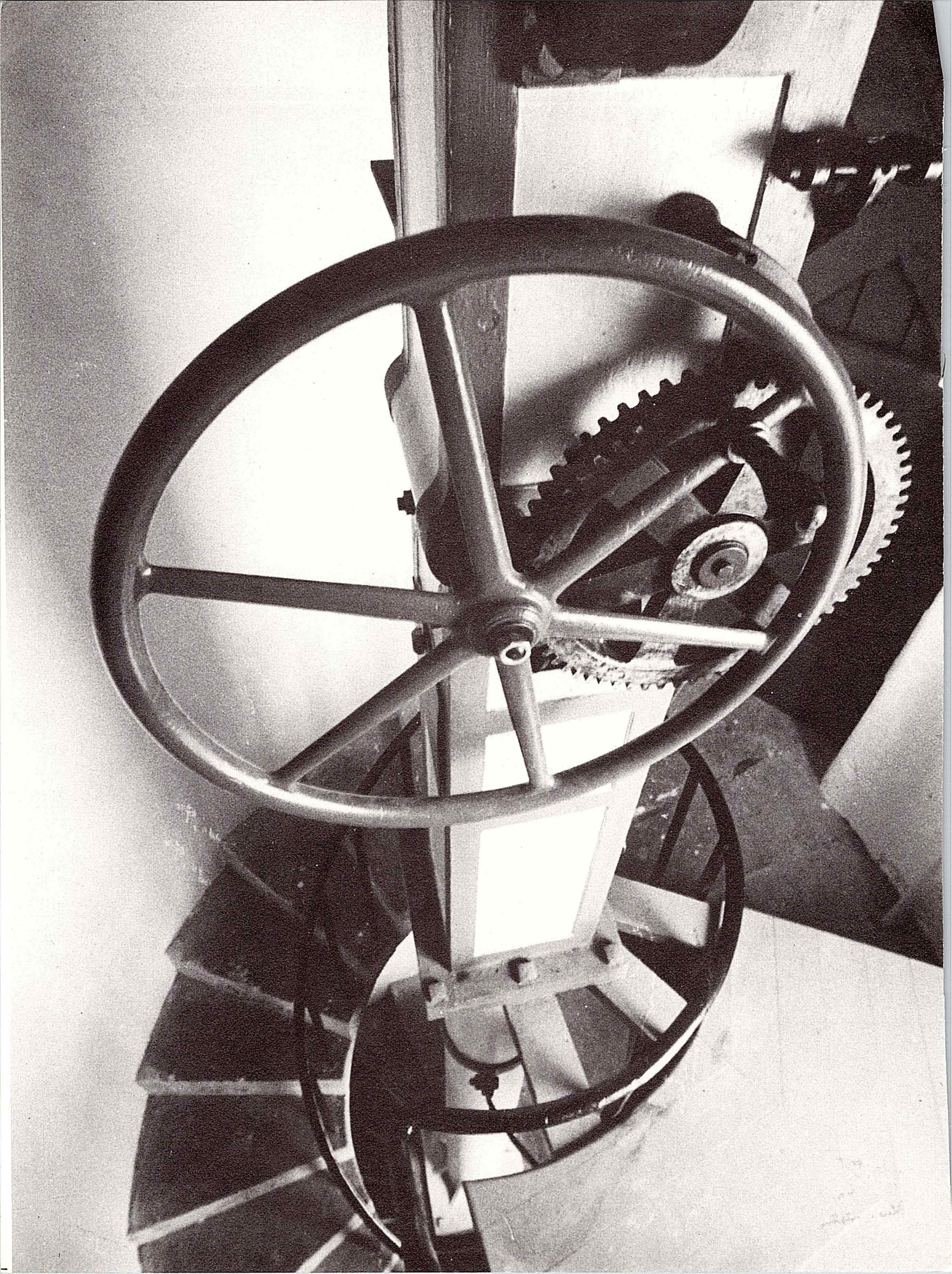
The LYTTELTON TIME-BALL STATION

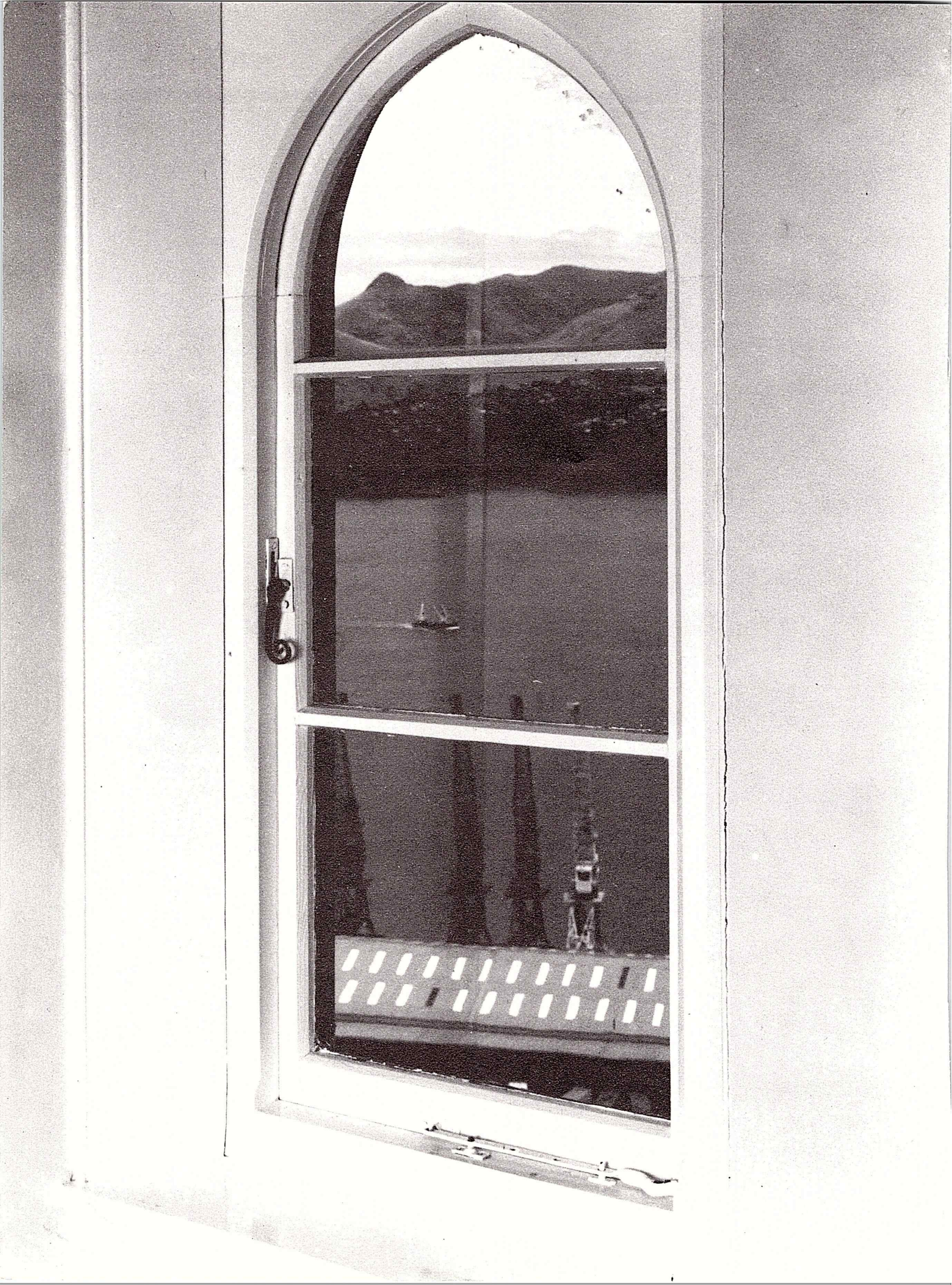
Cover: The time-ball station today. Inside front: The zinc ball whose drop gave the time signal. Page two: Looking down the spiral stairs that give access to the mechanism.



THE
LYTTELTON TIME-BALL STATION

An Account of its History, Operation and Restoration

NEW ZEALAND
HISTORIC PLACES TRUST



The Re-opening

On Saturday, 2 December 1978, the restored Lyttelton Time-ball Station was officially opened by His Excellency the Governor-General, Sir Keith Holyoake, G.C.M.G., C.H., before a large gathering of invited guests in the grounds of the station. Addresses were given by the Chairman of the New Zealand Historic Places Trust, Dr Neil C. Begg, by the Mayor of Lyttelton, Mr Melvyn Foster, and by the President of the Lyttelton Maritime Association, Mr Albion Wright.

Mr Wright thanked the members of the Maritime Association whose work and enthusiasm over eight years had made it possible for the building and time-ball machinery to be restored and preserved for the nation. It had been a much more difficult and far more expensive undertaking than had at first been calculated. Without the help and financial resources of the Historic Places Trust the task could not have been achieved by the Maritime Association on its own. But in 1969 when the building was threatened with demolition, it was the formation of the Lyttelton Maritime Association to save it that had first drawn the attention of the public to its unique and historic value.

Thanks were due also, he said, to the Lyttelton Harbour Board, the owners of the building and the land on which it stood. The Board first leased the property to the Association at a peppercorn rental and then later donated the land and building to the people of New Zealand. This generous action allowed the Historic Places Trust to assume responsibility and with some help from the Association to complete the work of restoration.

With its objects achieved, the Maritime Association was now being wound up and members would continue their interest in the Time-ball Station by giving their support to the Historic Places Trust.

Narrow Victorian Gothic windows look over the town and port.

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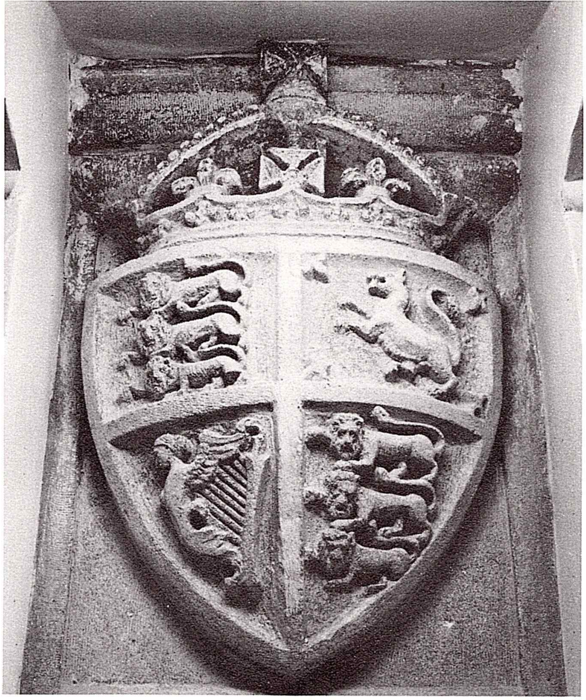
5 Pipitea Street, Wellington 1.

The kauri flagstaff dates from 1891. Here signals from the heads were relayed.

Photographs: Canterbury Museum, pages 16, 18; Christchurch Press, pages 2, 30; Christchurch Star, page 46; J. Crum Wilson, page 34 middle; D.S.I.R., pages 26, 28; D.S. Ferguson, pages 32 bottom, 38 bottom; Green & Hahn, page 36 bottom; Mrs A. Loach, page 38 top; Lyttelton Harbour Board, pages 14 top, 32 top, 44 bottom; Lyttelton Maritime Association, page 6; National Publicity Studios, cover, pages 4, 8, 9, 10, 20, 22, 40, 42, 48, 50, 52, 54, 56, 58, 62; Mrs E. A. O'Donnell, page 34 bottom; Porteous album, page 36 top; Alexander Turnbull Library, pages 12, 57; Mrs M. E. Webb, inside back cover, page 14 bottom; Mrs A. Whiton, page 34 top.



One of the two stone shields carved by William Brassington which were uncovered during the restoration.

A view through to the curator's living quarters.

Acknowledgements

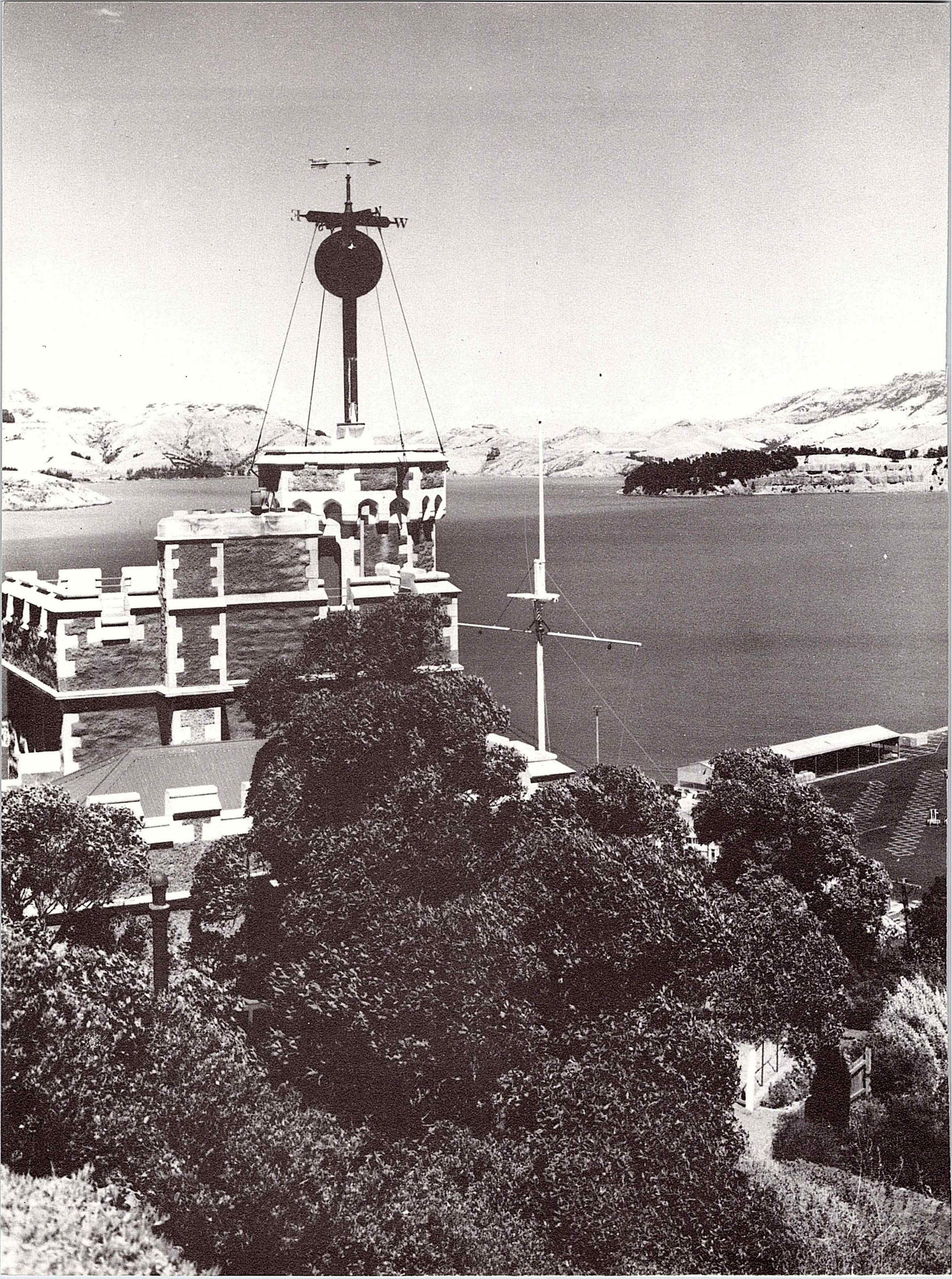
Material for this history was compiled originally by Denis Clibborn, former Office Manager, Lyttelton Harbour Board. Julie Bremner wrote the text and Professor F. L. W. Wood assisted with the final draft.

Information was obtained as follows:

The Provincial Council's part in importing the time-ball and machinery, and in providing the building: from Denis Clibborn with assistance from J. Crum Wilson and the staff of the Canterbury Museum.

The Lyttelton Harbour Board's part in administering, altering and staffing the time-ball building from 1877 to 1941, and the photographs: from Denis Clibborn.

The description of time-ball systems, of Dent's clock and the New Zealand Time Service: from George Eiby, Superintendent, Seismological Observatory, Geophysics Division, D.S.I.R. Longitude, chronometers, radio, Port Lyttelton, the flags, and the architecture of the time-ball building (as advised by A. P. Harper, Ministry of Works and Development): from Julie Bremner.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The Aid to Navigation

On the stone tower of the Lyttelton time-ball building, a ball dropped daily at one p.m. signalling time to ships in the port—the iron and steel mechanism below clattering like a shunting-yard on its sudden release. This was mechanical Victoriana in action, serving a vital, practical purpose.

Any ship's safety depends on an exact knowledge of its position. To the sailors of the eighteenth century, latitude presented no problem: for centuries it had been calculated accurately from observations using the ancient cross-staff or the astrolabe, or more recently the sextant. Longitude was a different matter. Until the invention of the chronometer, in the latter half of the eighteenth century, the problem of finding longitude had not been satisfactorily solved, and shipping losses attributed to this had been great. The situation was such that a £20,000 prize, no mean fortune in those days, was offered, and an English watchmaker called John Harrison invented the chronometer. He was almost too old to enjoy his prize when, nearly thirty years later, his invention was finally judged a success and the money was paid—in instalments.

With a chronometer on board, a ship's master was able to compare Greenwich time (as shown on the chronometer) with local time on board his ship, which was known by observations of the sun. He then calculated longitude mathematically from the difference between the two. The use of a chronometer to measure time out from Greenwich revolutionized navigation, and Captain Cook brought a chronometer on his second voyage to New Zealand in 1772, finally confirming the success of the new technique. From then on, a ship's safety depended upon the accuracy of the master's knowledge of time.

The time-ball in position ready to drop. The stays were added in 1877 to counter high winds.

The chronometer was an accurate timekeeper designed without a pendulum for a shipboard life. Errors of several seconds could accumulate during a long voyage, however, and chronometers had therefore to be checked whenever

possible. Since moving them ashore might cause further error, visual time-signals, often time-balls, became an important feature of many of the world's ports. The ball dropped at a known Greenwich time and any error of the chronometer could be noted. The error was simply noted, the chronometer itself was not altered. Accuracy was vital: a few seconds represent a lot of ocean. For example, four seconds of time is one minute of longitude and means about 6000 feet at the equator and half that at latitude 60°

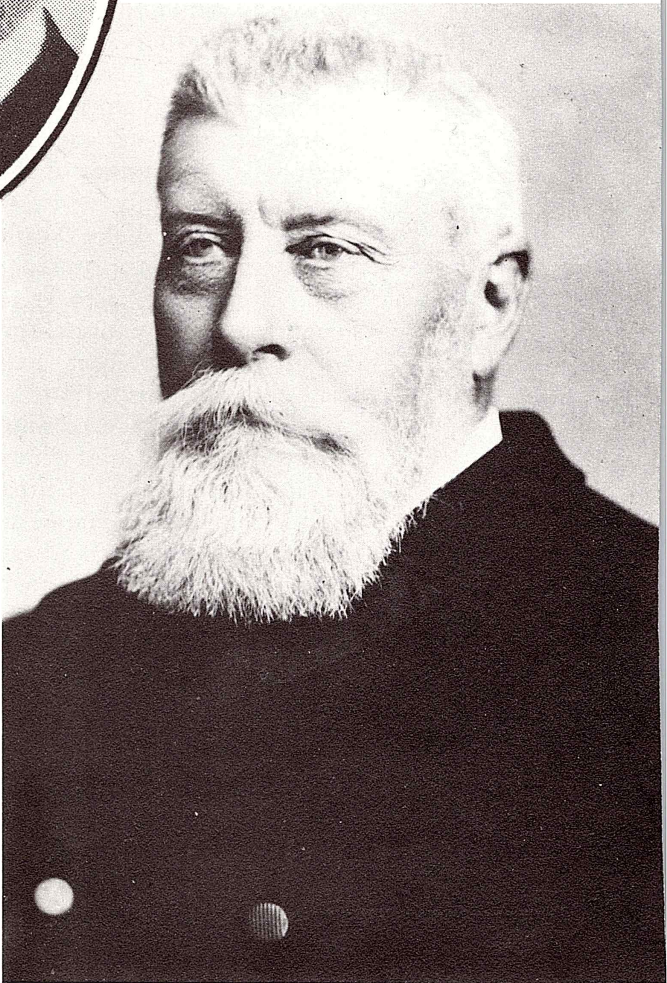
The first time-ball was built at Greenwich in 1833 and gradually others appeared around the world (Appendix I). In 1864 one was built at Wellington on top of the Customs House, and by 1868 a ball on Flagstaff Hill was a feature of Port Chalmers. The Lyttelton time-ball, the third in New Zealand and the only survivor, was built in 1876, a quarter of a century after 'the First Four Ships' brought the founding Canterbury settlers from England.

By the 1870s Lyttelton was a busy port.

By the 1870s, Lyttelton was a busy port. More than a hundred overseas ships called annually and total arrivals recorded in one year reached a thousand. Canterbury was progressive. A number of its farmers, contending with the problems of supplying markets on the other side of the world, established the New Zealand Shipping Company, a bold venture for a province whose capital was a town of only 8000 people. The great engineering project of constructing a railway tunnel through the hills between Christchurch and Lyttelton had been completed and the Rolleston administration made many improvements to Lyttelton harbour—dredging and reclamation were begun, breakwaters, jetties and wharves built, and steam cranes and gas lighting installed. Christchurch in 1881 had the first public telephone exchange in New Zealand, and the lookout station at the harbour entrance was soon connected by telephone to the Lyttelton wharf. A time signal for the harbour was a necessary part of this vigorous development.

The old time-ball, a well-known landmark, has kept watch over the port since clippers first took a few hundred bales of wool to the London sales and the early shipments of frozen lamb left for England. Now there is a vast export trade with complicated shipping movements, and radio

J. T. Peacock, who proposed a time-ball station for Lyttelton in 1870.



H. R. Webb, the Provincial Secretary, recommended that £500 be set aside for the project.

time-signals and even satellites have replaced the fall of the old zinc ball as an aid to navigation. Nevertheless, the restored time-ball works faithfully, serving with a few others—at Greenwich, Edinburgh, Sydney and Gothenburg—as a fine example of the technology of a century ago.

The Shipment

Canterbury's time-ball project was backed by two Australians in the Provincial Council, who had a long-term interest in shipping. Businessman and farmer J.T. Peacock was the son of a Sydney shipowner who had a fleet of ships in Lyttelton, and Henry Webb, Provincial Secretary, had come to Lyttelton initially to take control of the Peacock shipping business. The old Sydney time-ball would have been a familiar sight to both of them.

At a Council session in November 1870, Peacock proposed: 'That a respectful address be presented to His Honour the Superintendent requesting him to place upon the Supplementary Estimates a sum sufficient to erect a time-ball and tower at the Port of Lyttelton.' The motion was passed, and Webb contacted the Telegraph Department in Wellington who requested a quotation from London for a ball and its machinery and also a special clock: the ball was to drop automatically, released by an electric current which was to be switched on at the correct time by an astronomical clock. Electricity was one of Webb's many interests—he had demonstrated the first electric light in Lyttelton.

The Council's finance committee was chaired by an Englishman, Thomas Maude, Secretary for Public Works. He was an able and experienced colonial government official, but getting finance for this project must have tested his endurance. The quotation, 'about £500', duly arrived and in March 1873, after an unsuccessful attempt by Canterbury to split the costs (the Government in Wellington paying for the machinery while Canterbury provided the building), the Telegraph Department in Wellington ordered from London on behalf of the Canterbury Provincial Council 'one time-ball with all necessary apparatus and

(Copy)

12. Queen Anne's Gate. S.W.
London 27th June 1874.

His Honor
The Superintendent of Canterbury.
New Zealand

To Siemens Brothers

For the following goods ordered by C. Lemon Esqr. on the 14th March 1873 on a/c of the Canterbury Provincial Government Shipped pr. "The Douglas" London to Wellington. New Zealand.					
One Time Ball, with all necessary apparatus including electrical part &c -- -		650	0	0	
1 Astronomical Clock, of very best work to discharge the Time Ball at ~~Lyttelton~~ noon each day		96	0	0	
1 Battery stand with 6 Battery trays for Marie Davy elements -		3	16	0	
50 complete Marie Davy elements @ each -	2/6	6	5	0	
30 lbs Proto Sulphate of Mercury @ pr. lb -	4/6	6	15	0	
200 yds. Gutta Percha covered copper wire @ pr. yd.	-/3	2	10	0	
200 staples with nails, for fastening the wire to the wall @ pr. 100 - - -	2/6		5	0	
Packing - - - - - -		22	0	0	
Freight on 299 ft. 0 in. @ 40/- pr. 40 ft. and 5 %		15	13	11	
Insurance on £840 @ 22/6 % + Duty		9	11	3	
Customs Entry B/L and Shipping expenses		1	5	0	
					£813 1 2

one astronomical clock'. Fifteen months later the Council finally voted £750 to pay for them.

A German firm, Siemens Bros, which still exports heavy electrical engineering equipment to New Zealand, provided the ball and 'all necessary apparatus', and the clock was made by Edward Dent & Co., London, who had made the Big Ben clock twenty years previously.

In July 1874 all were sent from London, arriving in Lyttelton in November. Meantime the cost had risen. Siemens's invoice for £813 1s. 2d. was sent to Canterbury's London agent who was shocked at the price, but paid promptly nevertheless. Charges included £650 for the ball, apparatus and electrical parts and £95 for the clock.

Four years had already passed since the project had first been proposed, and a building had yet to be provided. For another twenty months the eleven large cases unloaded from the ship *Douglas* had to be kept in storage by the Lyttelton harbourmaster.

Installation

The Provincial Council had agreed to provide the building, but there was a delay over the site. Secretary Webb, who lived in Lyttelton, and the harbourmaster, Frederick Gibson, recommended the spur above Officers Point where an old flagstaff stood. From here signals could be seen from any point in the inner and outer harbour and from the Heads. There was some opposition to their choice from Wellington: C. Lemon, General Manager of the Telegraph Department, who had arranged the importation of the machinery, and W.H. Clayton, the Colonial Architect, thought that the roof of the new Lyttelton Post Office would be a suitable and cheaper site. Webb explained that the post office would be unsatisfactory because ships below Officers Point would be unable to see it, and again recommended the site near the flagstaff.

A Provincial Council letterbook notes the invoice from Siemens Bros, makers of electrical gear for everything from Victorian time-balls to today's space hardware.

At last a decision was made. In 1875 the Lyttelton Borough Council granted half a hectare of land (in today's measurement) near the flagstaff and the following year the Provincial Council constructed the castle-like building

London 27th June 187

~~Copy~~ Advice No. 6565.

His Honour the Superintendent of Canterbury
New Zealand

Sir

We beg to advise you that we have shipped per the "Douglas" London to Wellington N. Z. the undermentioned goods, ordered by C. Lemon Esqre on the 14th March 1873 on account of the Canterbury Provincial Government.

Packages	Marks & numbers	Gross cwt	Gross qr	Gross lb	Dimensions	Description
1 Case	G. B. 2646 Wellington	5	1	7	5'.1"x3'.7"x1'.10"	Containing Time Ball
1 case	2647	6	2	12	5'.5"x5'.5"x5'.5"	
1 case	2648	4	2	27	20'.0"x 11x11	
1 case	2649	2	2	0	5'.9"x2'.6"x9½	
1 do	2650	2	1	8	2'.7"x2'.2"x1'.5"	
1 do	2651	25	3	14	11'.0"x2'.11"x1'.10"	
1 Case	2652	3	0	24	6'.1"x2'.3½x1'.4½	Containing Astronomical Clock
1 do	3564		2	14	2.0½x1.10x1.2	Containing 50 glasses & cells for Line Marie Day elements
1 case	3565		2	22	1'.11½x1'.4x10"	containing 45 zincs & carbons joined 5 zincs & carbons poles
1 case	3566		1	25	1'.6½x11x11	Containing 1 Jar containing 30 lbs of Proto Sulphate of Mercury
1 case	3567	1	0	6	4'.11.x1'.9½x9½	Containing - 1 Insulated Battery Stand 6 Battery trays 200 yds G. P. Connection wire 200 staples with nails for do. do

which is still such a feature of the port. The Lyttelton time-ball and those at Deal in England and Adelaide in South Australia are among the few in the world to have had buildings specially constructed for them. Time-balls were usually found atop observatories, customs houses or navigation schools.

In April 1876 the time-ball apparatus was unpacked and inspected, and in July the Principal Mechanician with the Telegraph Department, named Smith, arrived from Wellington to install it. Presumably he took Siemens's drawing of the time-ball system with him when he returned to Wellington as it is still kept in the capital by the Harbour Board.

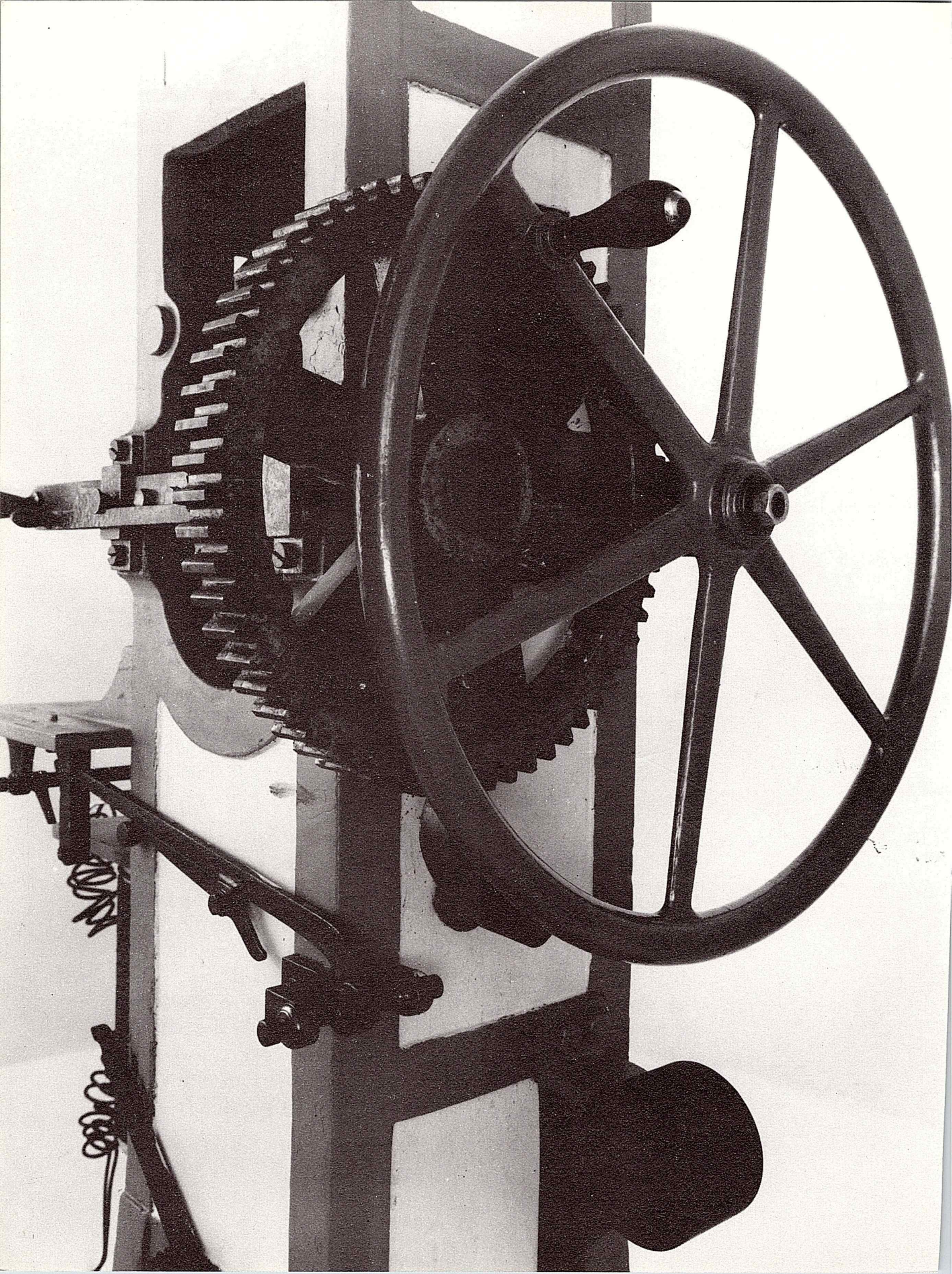
In June 1874 Siemens Bros in London advise the Superintendent of Canterbury that the eleven cases of components are on their way to Wellington.

Installation was completed by September 1876 and John Brunette, a Christchurch jeweller, was put in charge of the clock. He attached a telegraph wire to an indicator in the time-ball building so that the correct time could be received daily from the Observatory in Wellington via the Lyttelton Post Office. He was a skilled silver- and goldsmith, but he had trouble with the astronomical clock which was still not properly 'rated' when, in October, a resident time-ball keeper, Alexander Joyce, was appointed to take charge of the ball and mechanism. Joyce, a Somerset schoolteacher who until this appointment had been Lyttelton's first telegraphist, was responsible for hoisting the ball by a hand-operated wheel, and for servicing both the ball and mechanism. Which of the two men took charge of the novel 'electrical apparatus' is not recorded.

The Signal

The time-ball had to be hoisted manually to the top of the mast but at the right instant was released automatically by electrical apparatus. The ball dropped, giving a clear visual signal—the three-metre drop took eight seconds.

A few batteries and a length of copper wire produced the power which set the time-ball in motion. A description of how a time-ball's electrical system worked had been published in the Wellington newspaper when the city's own ball arrived years earlier in 1864 (Appendix II).



At Lyttelton, included in the cases which the harbourmaster had to store for so long were the stands and trays for the 'Mane Davey elements' (the galvanic batteries), a supply of fifty of the batteries which produced the electric current, the chemical which they required, and the copper wire which carried the current to a magnet in the mechanism. The wire was insulated with gutta-percha, a material produced from raw rubber before the vulcanising process was invented. Two hundred staples and nails were also part of the parcel.

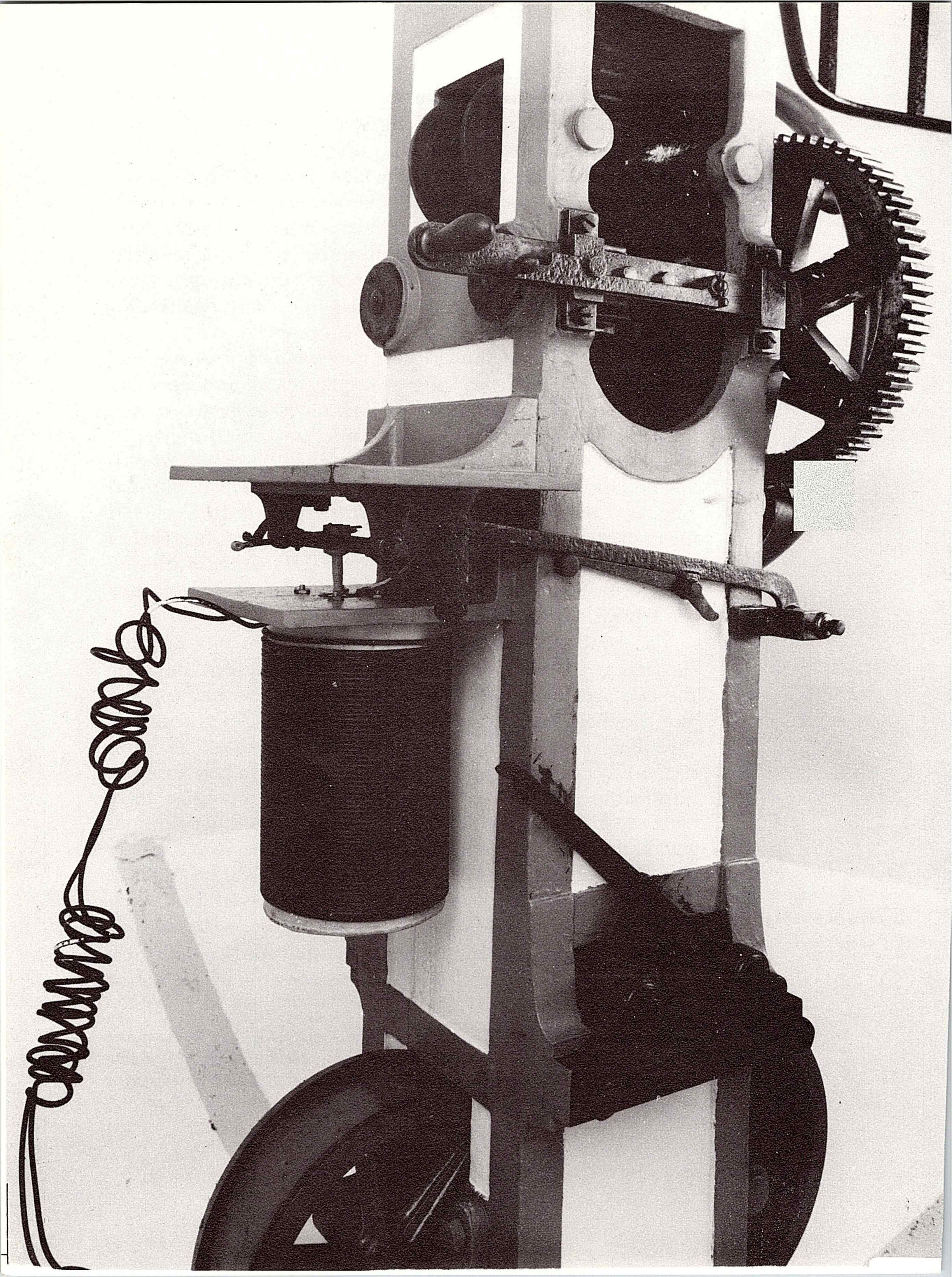
The ball seen on top of the tower today is the original, although with age the sphere has flattened and now has a many-faceted appearance. It had to be large to be seen from the Heads, and it measures one and a half metres in width and weighs more than a hundred kilograms. The hollow ball has a zinc frame covered with a thin sheet of painted zinc, and is threaded on to the Oregon pine mast by a hole through its centre. Attached to the bottom of the ball is a long iron rod ending in a piston which travels inside the hollow mast and disappears into the cylinder of the mechanism below.

The time-ball mechanism is fifteen metres tall, and has the ball at the top and the cylinder at the bottom. Between the two are levers and wheels which allow the ball to drop (see the diagram in Appendix III). No description can capture the overwhelming noise of the air trapped in the cylinder, which accompanies the drop and makes conversation impossible on the site. Everyone in Lyttelton must have been aware of what was happening without needing to watch the ball's descent, but woe betide the ship's officer on watch who let his eye stray from the ball up on the hill, as he waited to record the vital moment—the instant when the ball began to fall—which signalled Greeenwich time.

The time-ball was hoisted to the top of the mast by means of this handwheel.

George Eiby, in 1978 Superintendent of the Seismological Observatory of the D.S.I.R., describes how the whole system works:

> The time-ball is not a complicated mechanism. Before it can drop, it must be hoisted to the top of the mast and lowered gingerly on to a catch. This is done with the help of a rack and pinion driven by a handwheel. The process bears comparison with the setting of an old-



fashioned mousetrap. When the catch is pulled away, the ball slides rapidly down the mast and comes to rest on rubber buffers at the bottom. The speed of descent is controlled by a piston attached to the ball, which drives air out of a long cylinder rather like a giant bicycle pump. A tap at the bottom controls the escaping air and ensures that the ball falls quickly enough to provide a clear signal, but not so fast that it does itself an injury when it hits the bottom. Part of the keeper's duty was to keep the innards of the cylinder properly dosed with a mixture of linseed oil, beeswax and tallow.

The catch that released the ball was triggered by an electromagnet working on a set of secondary levers. The current for the magnet came from a bank of twenty-four wet chemical cells in the clockroom below, the circuit being completed automatically by the clock at a predetermined time. The hour, minute and second wheels carried separate contacts all of which had to be in the correct position to switch on the current. The slower-moving hour and minute contacts were made first, the release occurring when the second hand moved on to the exact minute.

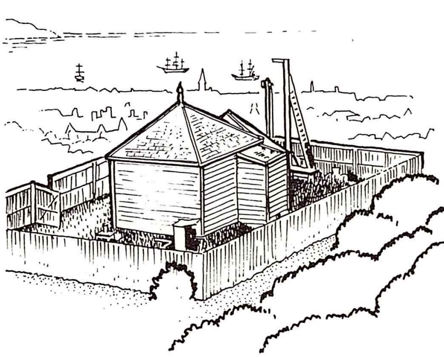
The clock is a fine astronomical regulator with a Grahame dead-beat escapement. The pendulum beats seconds and is compensated for changes in temperature. The unfamiliar arrangement of the dials is usual for astronomical clocks. The main one shows the minutes, and within it are two smaller dials, the upper one showing seconds and the lower one the full twenty-four hours. Each dial has a single hand. The driving force is a falling weight which will keep the clock running four or five days on a winding, though it is usual to wind more frequently to avoid a possible oversight.

When properly regulated, a clock of this kind will keep time to within about half a second a day, but it is still necessary to have some means of setting it to correct time in the first place and to keep a check on its wanderings, even if they are small.

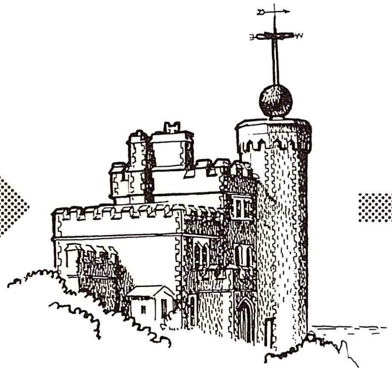
The fundamental standard of time for civil purposes is the earth's rotation, and the errors of our clocks have to be found by noting what time they show when certain standard stars cross the north-south line. In New Zealand these observations were made at the Colonial (later Dominion) Observatory in Wellington, which sent daily signals by telegraph to the post offices in most of the larger towns, including Lyttelton.

The release of the ball was triggered by an electromagnet.

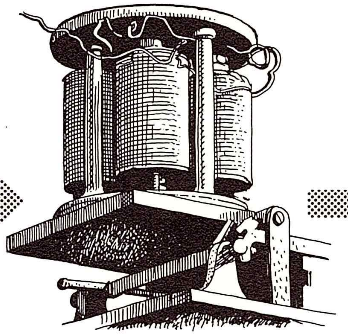
The first time-signal dropped on 29 November 1876 but was three minutes late. The magnet had 'acted imperfectly'. It was nearly a month before operations recommenced after this single performance, until on 23 December official time signals finally began, six years after the time-ball had first been proposed in the Provincial Council. On that day the *Lyttelton Times* published the harbourmaster's notice advising the public of the time signals:



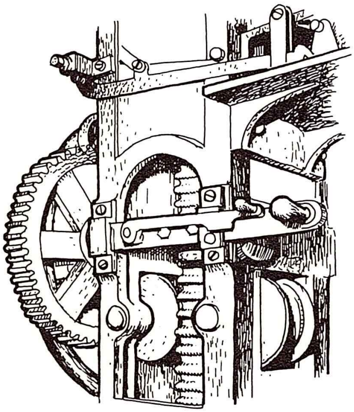
The Colonial Observatory in Wellington determines time by observing the stars, and sends time-signal by telegraph to the Lyttelton Post Office.



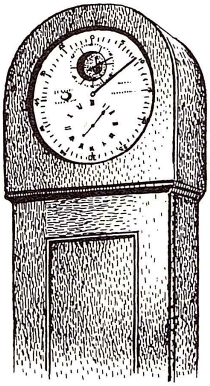
The Lyttelton Post Office sends time-signal to the time-ball tower by telegraph, to an indicator on the wall, so that astronomical clock's time will be absolutely correct.



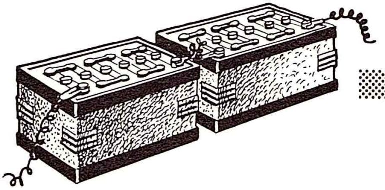
Around the magnet is wound copper wire carrying the electric current, so that the magnet will attract a steel plate setting the mechanism in motion.



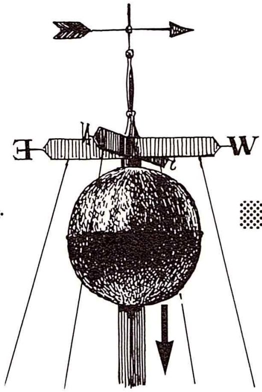
The mechanism's rods, levers and wheels act to pull away the release lever, allowing the ball to drop.



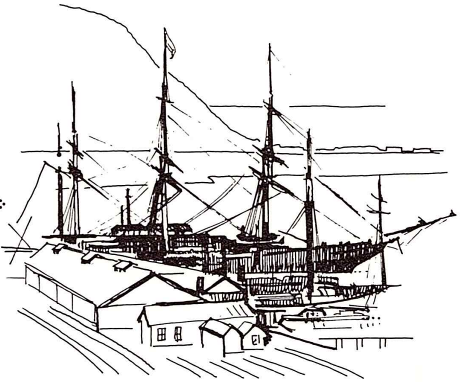
In the time-ball building, the clock has contacts which will release an electric current at a pre-determined time.



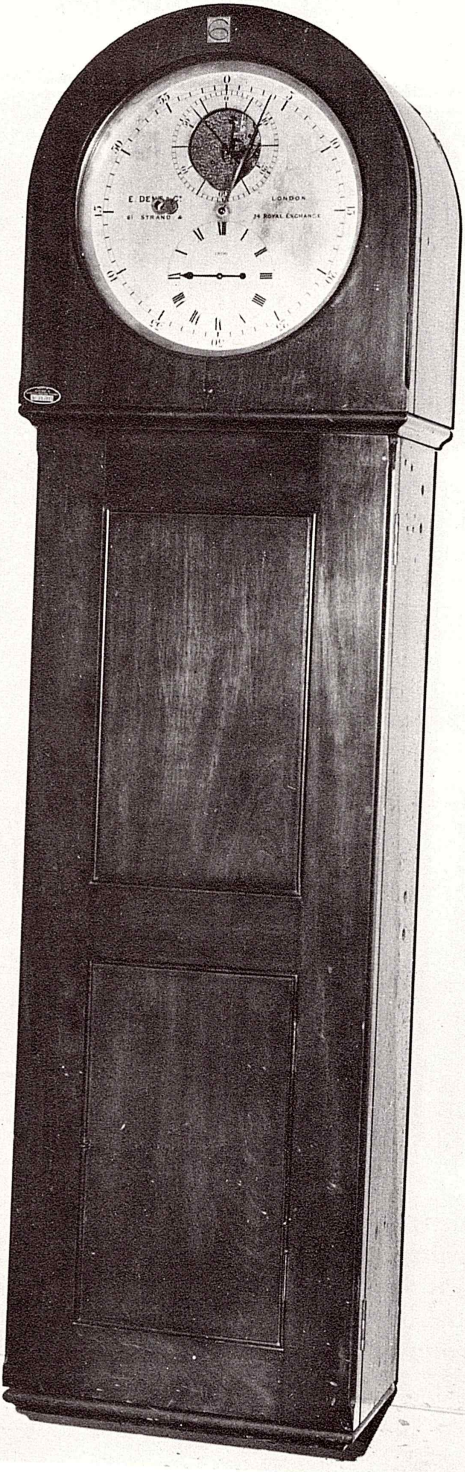
Batteries in the clock-room provide electric current which when a circuit is completed travels to a magnet in the time-ball mechanism.



The ball drops three metres in eight seconds. The time ships have to note is the moment it leaves the cross-arm of the vane. The ball drops at a known Greenwich time.



On board ship, masters note the error of their chronometers, which show Greenwich time, thus enabling their calculations for finding longitude at sea to be more accurate.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E. DENT & Co
LONDON
61 STRAND &
34 ROYAL EXCHANGE

TIME BALL, LYTTELTON

The Ball will be raised to the top of the mast at three minutes to one p.m. and will be dropped at one o'clock, New Zealand mean time, which is calculated on the 172 deg. 30 min. East Longitude; and is eleven hours thirty minutes fast of Greenwich mean time. The Greenwich mean time will therefore be one hour thirty minutes a.m. of same day.

The time to be noted is the moment at which the Ball leaves the cross arms of the Vane.

Should there be any correction necessary, a Black Flag with a White Centre will be shown from the roof of the building, immediately after the Ball is dropped, and the correction given in the newspapers of the following day. Should the correction be required by anyone leaving, it can be had from Mr Joyce, the Time Ball keeper, on the same day.

The Ball will not be raised when the wind is blowing hard, as there would be danger of straining the mast and injuring the machinery.

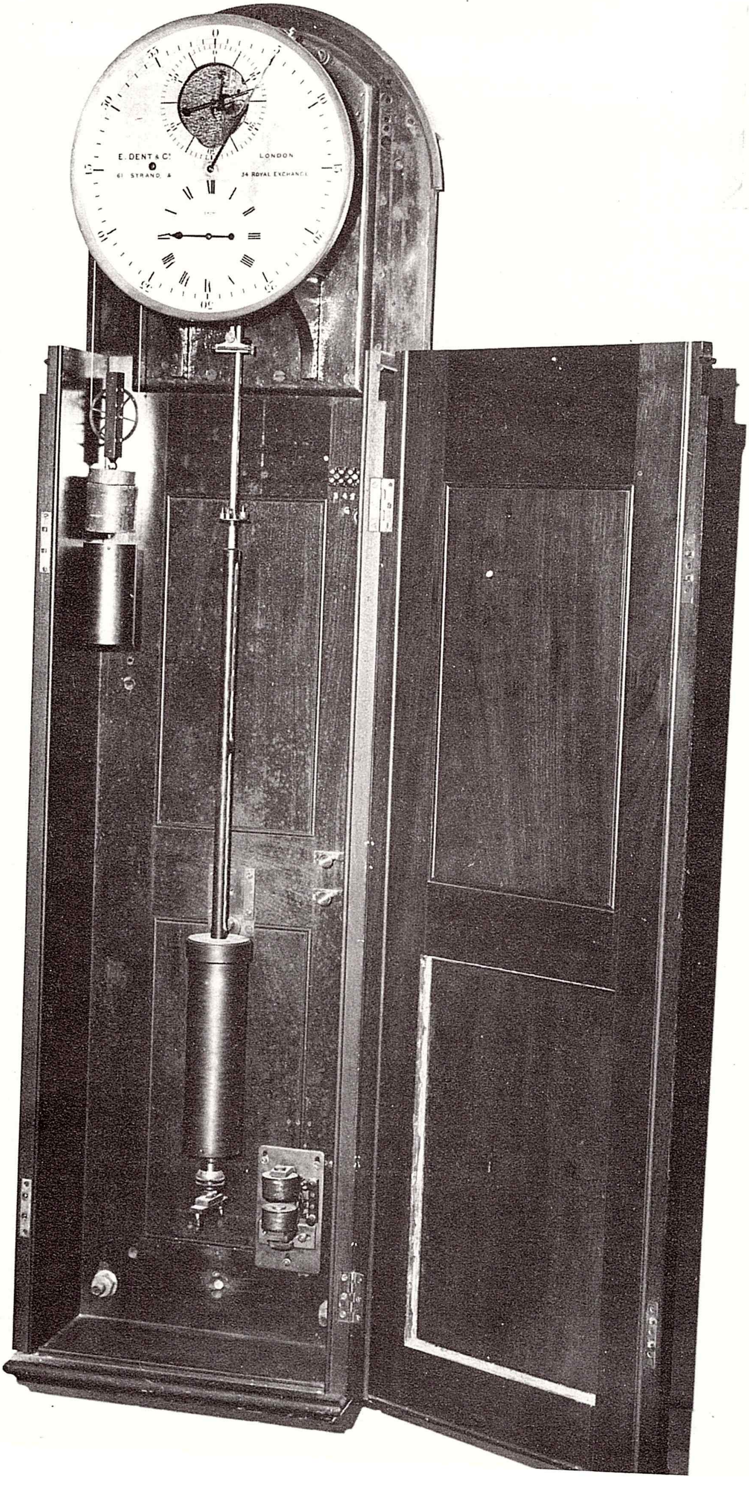
New Zealand first adopted a standard time for civil purposes in 1868. This was eleven hours thirty minutes ahead of Greenwich Mean Time. The legal time now in use is known as New Zealand Standard Time. It was introduced in 1945 and is twelve hours ahead of GMT. The situation is, however, complicated by the practice of daylight saving during part of the year.

Wind was clearly a problem and although stays had been included in the manufacturer's drawing it was not until a year later that stays and metal brackets were added to the parapet walls to stabilise the wooden mast. By then the newly-created Lyttelton Harbour Board had taken over control of the port and inherited the time-ball, whose system was to remain unchanged until World War I.

The astronomical clock, 'of the very best work', made by Dent & Son. The main dial shows minutes, the upper small dial seconds, and the lower small dial twenty-four hours.

The Radio Revolution

In 1916, the old astronomical clock which had been used in the operation of the time-ball was lent to the Observatory in Wellington. The Observatory wanted a further check on time on days when the stars were obscured by cloud, and, because of the war, they could not import another clock from England. Although the loan was initially for one year only, it seemed unlikely that the clock would ever be needed


E. DENT & Cº
LONDON
61 STRAND & 34 ROYAL EXCHANGE

in Lyttelton again, for the method of dropping the ball which involved the clock was already considered too inaccurate for use by shipping.

The Government Astronomer, Dr C.E. Adams, suggested that the ball should be released by a telegraph signal carried from the Observatory in Wellington directly to the time-ball mechanism, and, before the appointed time, switches were thrown at the Observatory in Wellington allowing the electric impulse from one of their clocks to activate the mechanism and drop the ball.

For economic reasons, the signal was now given only twice a week. Nor was this the only change made in the time-ball's operation. By the end of World War I the traditional 1 p.m. signal had been altered to 3.30 p.m. The reason for the change is unknown: it was probably made by the Observatory or Harbour Board to fit in with some aspect of staff routine.

In the 1920s, there was another change in the time the signal was given. This was caused by New Zealand experimenting with daylight saving*—the time-ball ignored the experiment and continued to drop at the same Greenwich time, so the change was more apparent than real.

Meanwhile, the effort to communicate absolutely accurate time to shipping was continuing; major developments in radio were initially undertaken for this purpose. The old Victorian time-ball was already marked unreliable in the Admiralty List and by the 1920s radio was being used regularly. Time was signalled by wireless on Monday and Thursday nights.

The clock with the top section of the casing removed and the door open to display the driving force.

In 1934, the Lyttelton harbourmaster advised the Board that nearly all vessels relied upon their wirelesses for correct time and it was decided that, after fifty-eight years' service, the old zinc ball should stop its signals completely. A brief entry in the time-ball logbook below the shipping arrivals and departures for the day, 31 December 1934, records: 'Use

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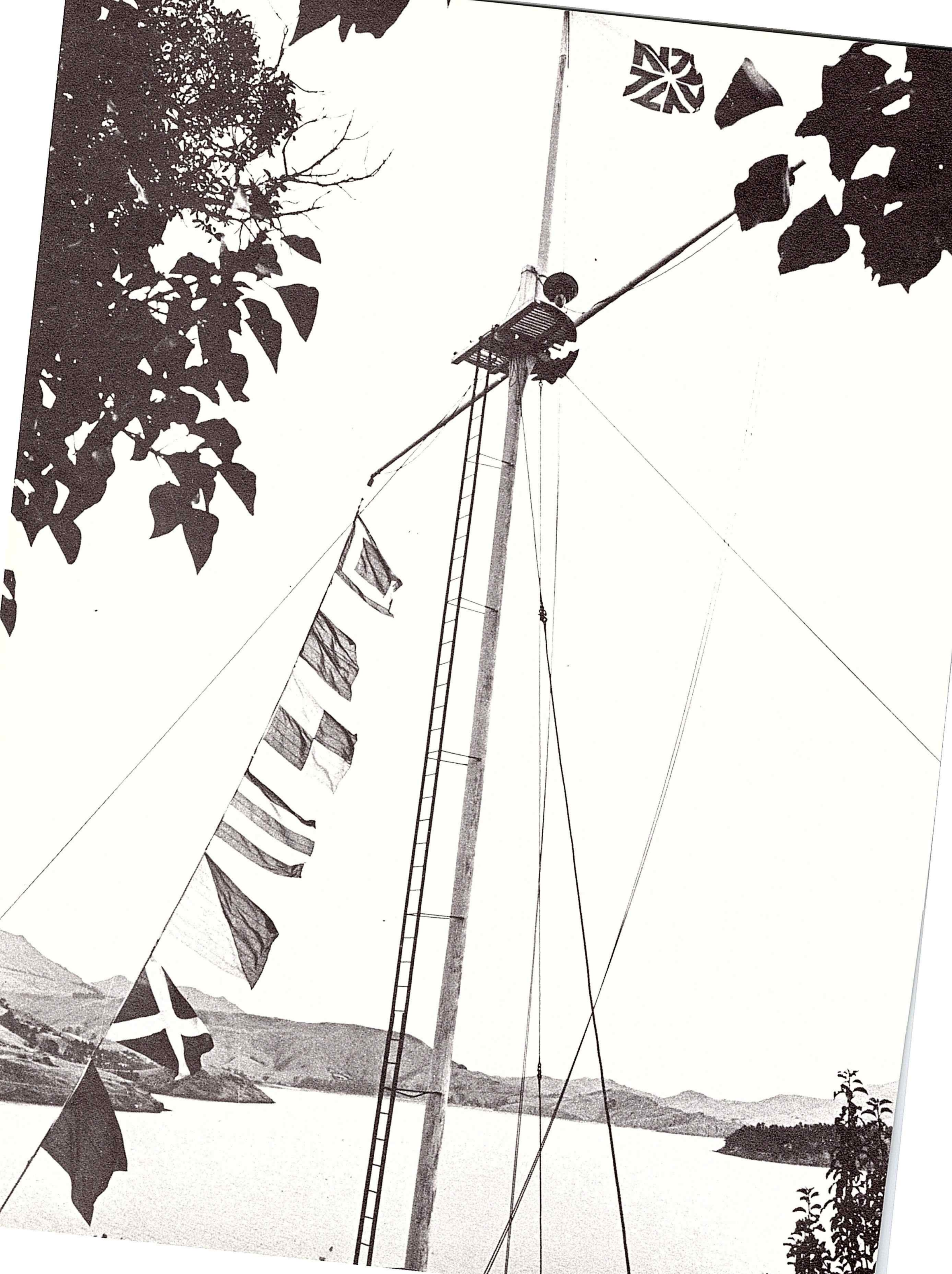
* Daylight saving was first introduced in New Zealand by the Summer Time Act of 1927. There were several amendments, including the Standard Time Amendment Act 1956. The current legislation is the Time Act 1974 which established New Zealand Time and a procedure for proclaiming Daylight Saving Time.



of Time Ball discontinued.' But shipping continued, and the time-ball station, if not the ball itself, was still to be in use for another seven years. The harbourmaster found signals from the station's old flagstaff an invaluable service to shipping in Port Lyttelton.

The Flags

Two signalling systems operated side by side on the windy hill above Officers Point. While the ball signalled time from its stone tower, flags were used on the old flagstaff nearby to speak to ships, and to signal shipping advice to the town, a service which preceded the time-ball and eventually outlived it.

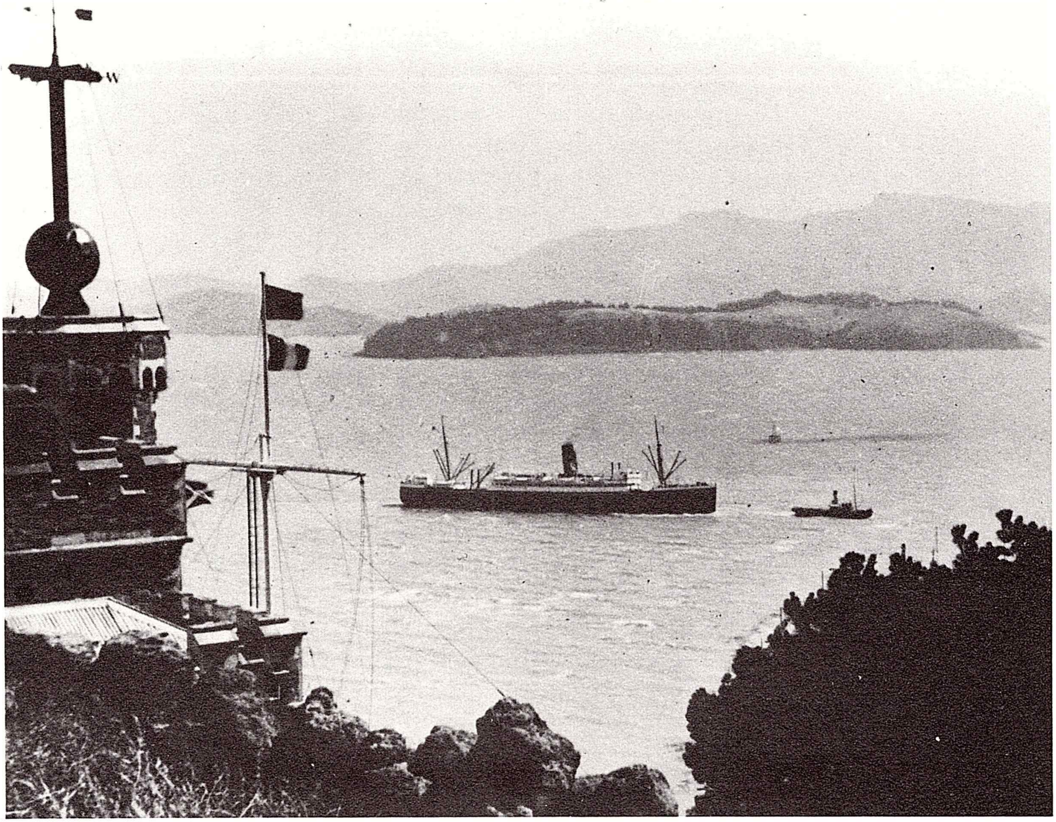
To that isolated town in the early days a ship brought not only trade and mail, but also news, and the flag-signal indicating an arrival created much the same excitement that a special radio newsflash does today.

How long the old flagstaff had stood there is unclear. It had probably been used for many years to call to work port officials and watersiders, scattered in their houses around Lyttelton, as it relayed advice of the sighting of a ship from any of three look-out positions around the harbour: from Major Hornbrook's farm high on Mount Pleasant, from Mark Stoddart, an Edinburgh admiral's son, across the water at Diamond Harbour, or from a look-out station at Adderley Head, which was built in 1867 on the southern side of the harbour entrance seven kilometres away from the time-ball site.

Flag signals fly again from the time-ball flagstaff to welcome athletes to the 1974 Commonwealth Games in Christchurch.

In 1879 the Harbour Board stationed a permanent resident signalman at the time-ball flagstaff, and until 1941 flag-signals from there played a vital part in directing Lyttelton's shipping.

The first flag-signalman to live at the time-ball—Alexander Joyce, the time-ball keeper, moved out when he moved in—was young John Toomey, fifteen years old. (He was the first if one discounts his brother Balfour who was there before him for a mere month.) John had taught himself the numerous signalling codes from books. From the time-ball station's look-out room (watchroom) or from the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flat roof of the building, he scanned the harbour, ready to sight the colourful signal away at Adderley Head indicating that a vessel had been seen far out at sea, so that he could repeat the signal and advise the town. If the vessel were approaching from the north, the flag-signal was shown on the northern yard-arm, if from the south, on the southern one. This first flag was the descriptive flag; its colour told the story—blue for a brig, red and white for a barque, and so forth. As she sailed closer to the Lyttelton Heads and the alphabetical code flags on board ship could be sighted, which spelt out her name, the descriptive flag was joined by these code flags. And so the town knew who she was long before the ship entered the harbour. In every port in the world a ship was known by the same alphabetical code flags. As the ship sailed up the harbour, a signal on the time-ball flagstaff advised her of her berth at the wharf.

The Shaw Savill ship Mataroa passes the Lyttelton time-ball station in 1934. Flag signals tell her to berth at No 7 Wharf.

No more than four flags could be hoisted in any one signal, and like the time-ball itself, they had to be large to be seen from the Heads. With an international vocabulary of thousands of signals, shipping could communicate regardless of language differences. Apart from the International Code of signals, which was known world-wide, Lyttelton had its own local code, published in the *New Zealand Nautical Almanack.* Young John Toomey learnt not only those, but also morse (for night signalling with an acetylene lamp), semaphore signalling with hand-held flags, and heliograph (a signalling apparatus reflecting sunlight).

From his vantage point, the time-ball signalman could see parts of the harbour not visible from the Heads or the wharf, and he was responsible for signalling ships to delay in order to avoid collision. He had also to keep watch for fires, for dumping of rubbish, and for ships which altered their positions without authorisation. He kept a written record of shipping arrivals and departures.

Retaining walls and access road were built by prison labour from Lyttelton Gaol in 1876.

Although the Heads and the wharf were connected at first by morse telegraph, and by 1880 by telephone, these methods of communication were used only when fog obscured the flag-signals.

For thirteen years John Toomey remained in charge of the time-ball station's flag-signalling, and just before he left

Alexander Joyce (photographed in fancy dress), telegraphist and time-ball keeper from 1876 to 1914.

John Toomey, wearing Harbour Board uniform; he was flag-signalman from 1879 to 1892.

a new kauri flagstaff replaced the old one, which by then could not be seen above the trees of the Borough Reserve. The 1891 flagstaff is the one that stands there today, but the metal yard-arm on the pole is a later addition.

Toomey was followed by three successors before flag-signalling gave way to radio-telephone during World War II. In the logbook was recorded the final signal—'At what time can I be berthed?' from the *Miro* on 27 November 1941. After this date, flag-signals were still shown from the Heads for a few years, but in 1949, when a radio-telephone tower was built on Gladstone Pier, there was direct communication between ships and the wharf.

The flagstaff has not fallen entirely into disuse, however. To celebrate Canterbury's Anniversary Day, a special signal is hoisted on the time-ball flagstaff on the spur above Officers Point. It continues a tradition begun in 1930 when the code name for *Charlotte Jane* was hoisted to commemorate the arrival of the first of the four ships from England on 16 December 1850.

Alfred Button, Crimean War veteran, served as flag-signalman 1892–1905.

On Anniversary Day in 1969 the old time-ball too was once again hoisted to the top of its wooden mast, for the first time in thirty-five years, as a signal to Canterbury and to all New Zealand that its restoration and centenary were fast approaching.

The Signalmen

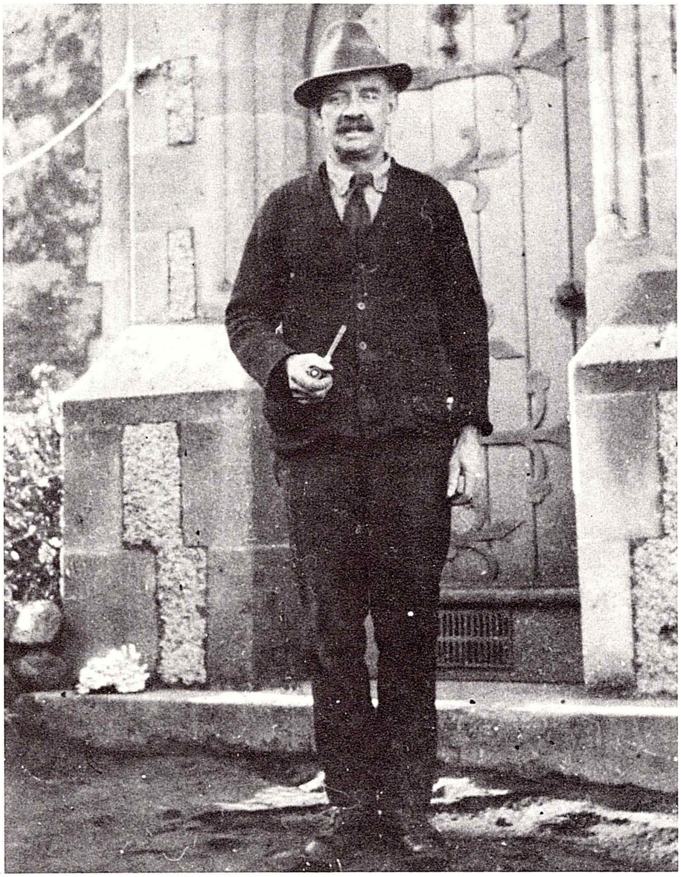
Alexander Joyce (1840-1927) Born Somerset. Schoolmaster and Lyttelton telegraphist. First time-ball keeper 1876 to 1914. He was not a flag-signalman.

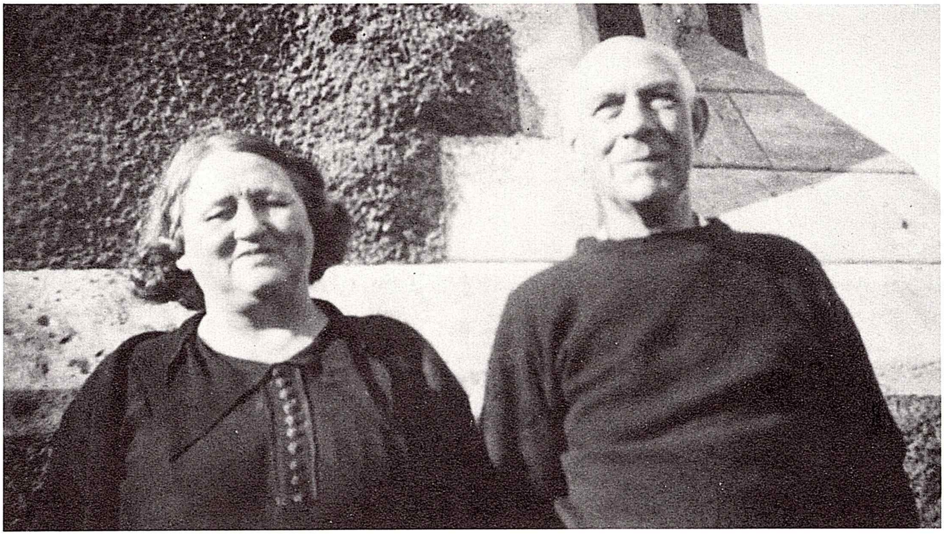
John Toomey (1864-1916) Son of a Lyttelton sea captain. Flag-signalman 1879 to 1892, teaching himself the codes from books.

Alfred Button (1830-1911) Born Kent. In Royal Navy during the Crimean War and later an Auckland dairy farmer. Flag-signalman 1892 to 1905.

John Porteous (1869-1934) Born Lyttelton and learnt flag-signalling in the Naval Volunteers. Flag-signalman 1905 to 1932, responsible also for time signals after 1914.

John Porteous was flag-signalman 1905–32 and time-ball keeper from 1914 to 1932.





Jack Burns (1879-1961) Farmer's son from Central Otago. Army-trained signalman in Royal New Zealand Artillery. Flag-signalman and time-ball keeper 1932 to 1941.

The Scoria Castle

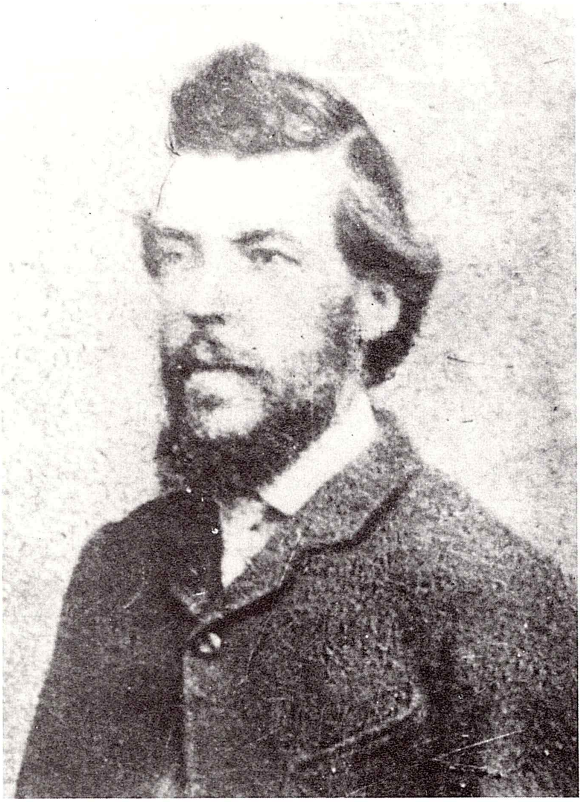
Lyttelton's 'castle' is literally a part of the hillside on which it stands as a nautical landmark: it was built of scoria from the Sumner Road quarries nearby. It is sad that its mellow brown walls of local volcanic stone had so soon to be covered by cold cement stucco. Only the sparkling white limestone around the doors and windows remains uncovered today. The twentieth century can only glimpse the true 'scoria castle' of 1876 depicted in Thomas Cane's delightful water-colour painting which is reproduced in this book.

The Provincial Architect, Thomas Cane, formerly of Brighton in England, was a new arrival in Christchurch, but had a slight previous connection with the colonial Canterbury—he had worked in London under Sir Gilbert Scott, who designed the Christchurch Cathedral. Cane was appointed to his post in August 1875 and by November had submitted his plan for the time-ball's three-storey building with its charming octagonal tower. Other Christchurch designs by this architect and artist include a Neo-Gothic building on the corner of Hereford Street and Rolleston Avenue, now part of the University Library, a wooden building at Christ's College known as Condell-Corfe House, and elaborate choir stalls in St Michael's Church on Oxford Terrace.

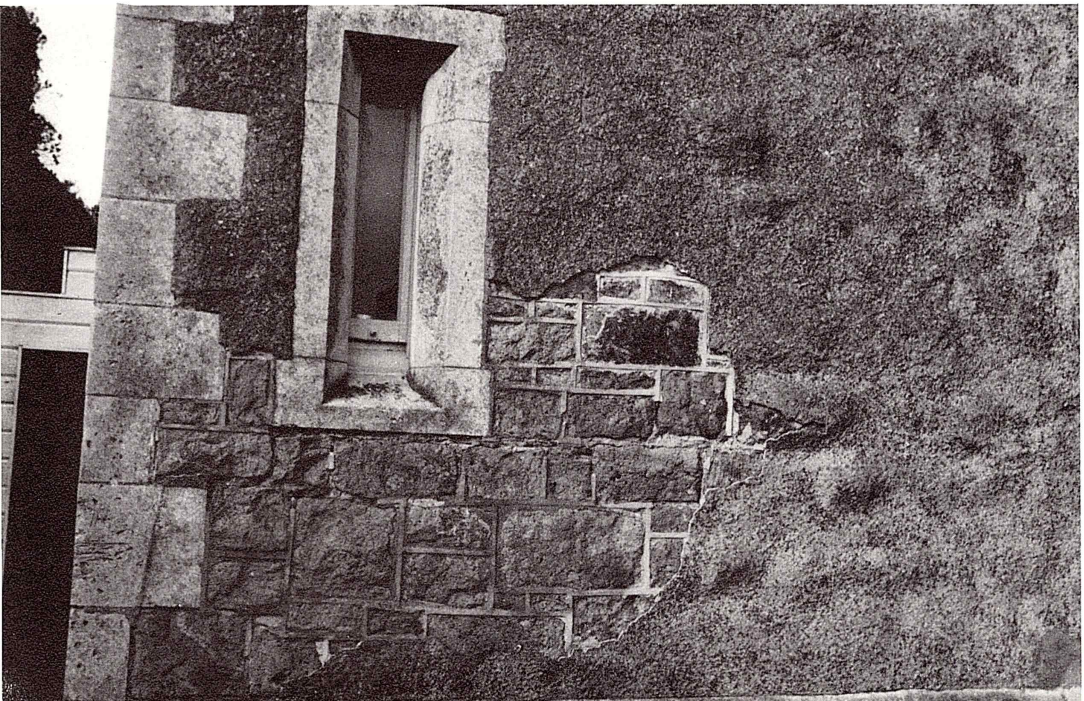
The time-ball site had been chosen and some of the land (just under half a hectare) had been granted by the Borough Council in 1875. The boundary lines were not very clearly defined as 'commencing 155 links [31m] south-east from a stack of stones forming the north-east corner of part of Reserve No. 68', so it is not surprising that title to the remainder of the site was not obtained until 1932 when it was applied for 'on the grounds of unchallenged occupation for over forty years'.

Mr and Mrs Burns. Jack Burns was flag-signalman and time-ball keeper 1932–41.

When Cane finished his plan (which unfortunately has since disappeared) the time-ball machinery had already been stored for nearly two years by the Lyttelton harbour-



William Brassington, the master stonemason who built Lyttelton's 'Scoria Castle'.



master. But progress soon accelerated. By January 1876 a road had been cut from the Sumner Road past the old flagstaff, and labourers from the Lyttelton Gaol had prepared the site by cutting a platform in the rocky hillside. The rubble from the excavation was retained behind a semi-circular stone wall. The south-east corner of the building is on this fill, not on rock, and has subsided very slightly—cracks are evident but are not increasing.

The master stonemason William Brassington and his partner John Kennington submitted the lowest tender— '£1,095 for the stone and brick work [or £123 less if rubble was put on the ground] plus £495 for the carpenters' work' —and they landed the job. Brassington had already built the main chamber of the Provincial Council building, where his stone carving on bosses, brackets and capitals is worthy of notice. A little church at Allandale and the Church of the Holy Innocents at Mount Peel are also his work.

At the time-ball building project he probably had labour to assist with the random rubble stonework of the scoria walls and saved his skill for the more precise work in white limestone. The dressed limestone, which forms a most decorative contrast, was cut with the necessary precision to surround doors and windows, and was used also in the quoins which give firm corners to the building and supply the main strength of the walls. It was brought up the coast from Oamaru by sea, and was damaged by salt spray even before construction. It has since been further corroded by pollution from coal-burning ships and eroded by the wind. The white stone also caps the battlements on the roof and was used in the drip band course—the white horizontal line a metre or so below the battlements—which projects from the face of the building to stop water dripping on to the scoria walls.

Brassington's expert stonework is revealed under the stucco which had covered it since 1880.

Today experts continue to admire the high quality of Brassington's stonework. The charming spiral stair in the tower is another fine example of the precision of his work. The lower part of the stair is integral with the column which it encircles—column and step are cut in one piece and the step is cantilevered out from the centre. A freestone from the Cass Peak quarry on the Peninsula was used for this

work, as it can be carved in any direction without splitting.

On top of the sixty-one-centimetre-thick column is mounted the time-ball machinery, and at this higher level, the stair encircles a void with the cast-iron time-ball cylinder inside it. A spare, elegant, wrought-iron handrail adds charm to this admirable setting for Victorian machinery —a stone tower with a spiral stair is most unusual in New Zealand. Above, the white stone roof is supported by iron girders and outside on the tower roof stands the old time-ball on its Oregon pine mast. The tower adjoins the building on the south-east corner, and the spiral stair gives access to the clock-room, the look-out room and the flat roof, as well as the mechanism.

Four narrow, pointed, Gothic windows are set in a vertical line in one face of the octagonal tower. There are no battlements on this roof: the parapet is moulded in white limestone, and the white stone corbels a few metres below, which give the tower its arched effect, are not only decorative but necessary to support the parapet.

In August 1876 the *Lyttelton Times* reported that the building was completed. The newspaper recorded that Portland cement had been used in the two-foot (61 cm) thick walls, and that mysterious 'frequent bands of hoop iron' also bound the stones —these have not so far been rediscovered!

The three-storey building is 10.4 metres high but not large; three residential rooms and two working rooms total 79 square metres. Interesting timber ceilings have kauri joists and Oregon pine beams, which are laid on stone corbels rather than set into stone walls where they could rot. Baltic pine is used in the floors and the four-panelled doors, which have diagonal match lining. Banks Peninsula may have been rich in stone quarries, but little suitable timber grew there and it was cheaper to use imported wood.

The unusual spiral stairway, built of stone, which encircles the central column.

White stone fireplaces, usually angled into corners in the small rooms, are in both residential and working sections. On the top floor is the look-out or watchroom from which the signalman on watch with binoculars or telescope could read the flag-signals at the Adderley Head signal station at the harbour entrance. The building's flat lead roof,

intended as a look-out station in fine weather, caused this room to be unbearably hot in summer and cold in winter. A narrow wooden staircase leads to both floors. Initially there was no entrance hall and no bathroom, and throughout the building all the casement windows opened inwards and so leaked.

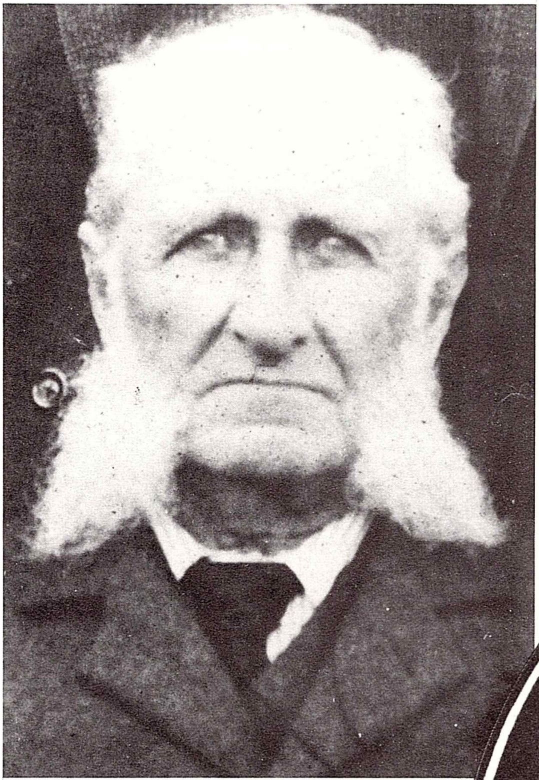
Unfortunately the casement windows were not all that leaked. The local volcanic stone was found to be too soft and porous, and rain soaked through to the inside walls. Scoria from Redcliffs quarry had been used seventeen years previously in the towers and foundations of the Provincial Council buildings in Christchurch but seepage had not been a serious problem in that less exposed situation. Within a year (March 1877), the Lyttelton Harbour Board had inherited the time-ball building and a new architect was appointed to study how to make the walls weatherproof.

The Waterproof Coat

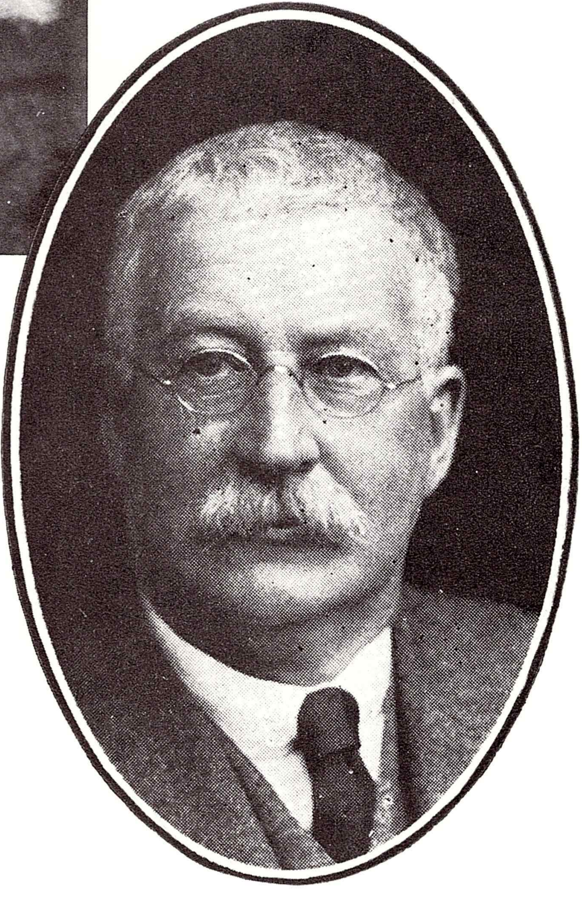
Frederick Strouts, a founder of the Canterbury Architects' Association (the first of its kind in the country), produced the report on the time-ball building and plans for additions and repairs in 1877. Repairs were minor—plastering, replacing joists, refixing skirtings, varnishing and relaying linoleum—after the addition of a new kitchen wing to extend the old kitchen on the north wall. The architect's plan is lost, the Harbour Board minutes and the tender advertisement in the newspaper are not specific, but a letter to Strouts dated 1877 mentions the proposed kitchen and stonework at the joints confirms that the single-storey kitchen wing was indeed added after the main construction. The work was done by Holliss and Williams for £333, and labourers from the gaol again assisted with the kitchen and the new stone walls which were erected in the grounds at this time.

The base of the central column which supports the time-ball mechanism.

William Holliss (1827-99) had arrived in New Zealand in 1863 from Stratford-on-Avon and constructed several buildings for the Harbour Board, including the Board's own office building of 1880 which still stands. On the hills of Lyttelton are still to be seen houses built by Holliss, who offered a trio of designs at three different prices.



Frederick Strouts, the architect who planned the 1877 additions and repairs.



Cyrus Williams, harbour board engineer, who designed the new wing in 1912.

Strouts recommended the application of a petrifying liquid, which would not discolour the stone, to seal the outside walls of the whole building. Perhaps this product was unavailable because silicate was used, less for waterproofing than to stop flaking by binding the surface of the stone. Three years later the scoria in the outer walls had to be cemented, in a further attempt to waterproof them. The cement, sand and gravel mixture was thrown onto the walls using the old Scottish method called harling. However, it contained too much cement and did not bond well.

Thus by 1880 Lyttelton's castle on the hill was completed, until, thirty-two years later, further extensions were necessary.

By 1911 conditions had become intolerable for the Porteous family who were then occupying the building. None of the rooms had been distempered since 1905 and damp was obviously still a problem. Only two rooms were suitable for sleeping though there were seven Porteous children. There was still no bathroom, which by 1911 most people considered a necessity, and it was surely time to replace candles and kerosene lamps with gas lighting, said Mr Porteous in a letter to the Lyttelton Harbour Board.

The Board agreed. A plan for a two-storey extension over the front door and the old kitchen wing was drawn up by Cyrus Williams (1862-1942), an Australian who had been appointed Harbour Board Engineer in 1902 from among sixty applicants for the position. The new wing was planned with the entrance porch, bedroom and bathroom on the ground floor and another staircase to two bedrooms upstairs. Williams wrote that the work must be done 'without sacrificing the appearance and character of the present building, which I cannot recommend as it is a handsome monumental structure and a feature of the landscape'.

Holliss and Brown's tender of £663 was accepted. The two-storey addition was built of brick and covered with stucco to conform in appearance with older parts of the building. This stucco contained broken stone instead of gravel and has weathered well. Oamaru stone was again used in the battlements and pointed Gothic doors and windows which all retained the style of the original design. Even

the bathroom has a Gothic window. The roof was of corrugated galvanised iron. In the old building the casement windows were at last altered to open outwards so that they could be weatherproof when open. Interesting hinges were fitted: the flaps are on the outside, in ship's carpentry fashion.

Although so carefully designed to match the old buildings of the 1870s, the new wing gives itself away inside: an Art Nouveau fireplace is obviously 1912.

The Restoration of 1975-8

In 1941, when the colourful flag-signalling ended and the time-ball had already been in retirement for seven years, the Army took over the building. Flag-signalman Jack Burns and his family left 'the castle on the hill' but they were not the last family to live there. After World War II the Harbour Board again used the old building to house staff, but gradually it fell into disrepair and by the 1960s was vacant. Many of the interior walls were black with moss, and conditions continued to deteriorate. Neither the owners, the Harbour Board, nor the Lyttelton Borough Council welcomed the expense of preserving the building, and the historic significance of a time-ball would have been forgotten had it not been for the enthusiasm of a few people.

In 1969, with something of the dynamism shown by their forbears nearly a century earlier, the people of Canterbury went into action and 217 enthusiasts became members of the newly-formed Lyttelton Maritime Association to restore the nautical landmark above Officers Point. A seafaring background was provided by the president, Captain A. R. Champion, and A.C. Brassington, a grandson of the original stonemason, became the patron.

James Cormie, a Scottish stonemason, and his assistant working on the Oamaru stone of the battlements.

The project suffered a setback almost immediately. At Easter 1969 vandals damaged the time-ball's mechanism, smashing the manual gear-wheels and stealing the vital electromagnet. It was never recovered, although the metal plate bearing the makers' name, Siemens Bros, was found in nearby scrub. By a lucky chance, a television film included a photograph of the magnet, and a replica was made by the Ministry of Works.

The mechanism of the time-ball was first dismantled and reassembled by George Foster, an instructor in the instrument section of the Air Force, and then cleaned by Frank Teague, who had a clock shop and an antique clock collection. Some new parts for the mechanism were made by engineering firms Alec Farrar Ltd and Sinclair Melbourne & Co. Finally, by December, it was possible to raise the time-ball manually, and the association had found tenants to look after the building and avert the risk of vandalism.

A massive clean-up began: roof, gutterings and ceilings were repaired, electric wiring renewed and the site cleared with the help given in traditional manner by the Justice Department through their adult periodic detention work scheme.

The campaign for restoration had been well and truly launched but the association faced daunting financial problems. A small association with $2000 in the bank and no title to the property had no hope of raising money for restoration. And the estimates for the work increased alarmingly. In 1971 it had been thought that $11,700 would be required, but the final figure when the work was finished was nearly $100,000.

In 1973 the Historic Places Trust shouldered the burden, and the Ministry of Works and Development has carried out the restoration under the architect A.P. Harper. Both he and the Scottish stonemason James Cormie had had previous experience of restoration masonry in the United Kingdom.

The upper part of the spiral stairway encircles a void with the time-ball cylinder inside it.

In 1975 work began. Twenty per cent of the stucco of 1880 had fallen off the original building and tower, and the rest was easily removed. Although the random rubble scoria stonework which was once again revealed could now be sealed without stucco, it was decided to use this method again in order to match the finish on the 1912 brick addition. A cement and sand plaster containing gravel from Kaiapoi was used. Cormie replaced and repaired the damaged Oamaru stone and his 'castle' cleaning, involving scraping off the polluted surfaces to remove the corrosive substances, was completed by November 1976.

It is, however, the restoration of the machinery which captures the popular imagination. The mechanism was full of water and was left submerged, so that no further rusting could occur, until the tower roof had been repaired. A fibreglass reinforced skin was applied to seal the Oamaru stone of the tower roof, which was badly wind-eroded, and then another setback in the machine's restoration was encountered: where was the piston? The Ministry of Works could only assume that it had dropped into the tall cylinder, and an elaborate method was devised to retrieve it from the narrow iron depths. In the nick of time, and after a desperate search by the Maritime Association, the piston was discovered wrapped in newspaper in Frank Teague's storeroom in Burwood. Teague had been working on it but died suddenly before returning it to the mechanism. The old rods, levers and wheels could now be restored to good working order by mechanics.

The time-ball can today once again proclaim noisily that its forty-four years' silence has ended. The tall ships have gone and seafarers are no longer on 'ball time', but the Lyttelton restoration has already inspired and assisted similar work on the old time-ball at Deal in Kent. The Maritime Association, under its second president, Albion Wright, remains the guardian of the mechanism which it has rescued, while the New Zealand Historic Places Trust administers the building.

Tony Harper, the architect in charge of restoration, looks up at the hole in the tower ceiling, above which are the buffers on which the time-ball rests.

The astronomical clock, kept running at the Observatory in Wellington, has been returned to Canterbury. Whether it will again play its role in the time-ball system remains to be seen. To employ it in the same way as in 1876 would entail very frequent adjustments to its delicate mechanism to keep the signal sufficiently accurate for today's standards, and it is thought the clock may be too old for such constant handling.

The electrical system is now run by a transformer—the old batteries are only showpieces these days. A length of gutta-percha-covered wire discovered in disused circuits in the Provincial Council buildings in Christchurch is at the time-ball.

FLAG-SIGNALLING SYSTEM

With the ancient volcanic stone still sheltering its fascinating mechanism, New Zealand's only remaining time-ball, dominating the windy hill at Lyttelton, is now carefully launched into its second century. It is probably surprised to find that it has an important place in the world as a rare operational example of the nautical technology of times past.

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Receipted Accounts Books I, II and III, 1877-81 (Lyttelton Harbour Board).

Time-ball Signal Station Arrival & Departure Logbooks (Lyttelton Harbour Board).

Correspondence files, Time-ball, 1877-1977 (Lyttelton Harbour Board).

Personnel files, Minutes, and Annual Reports (Lyttelton Harbour Board).

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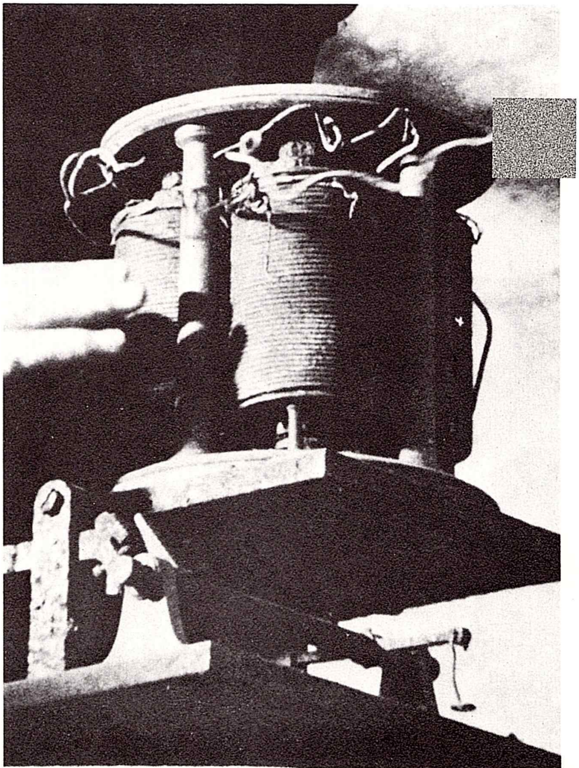
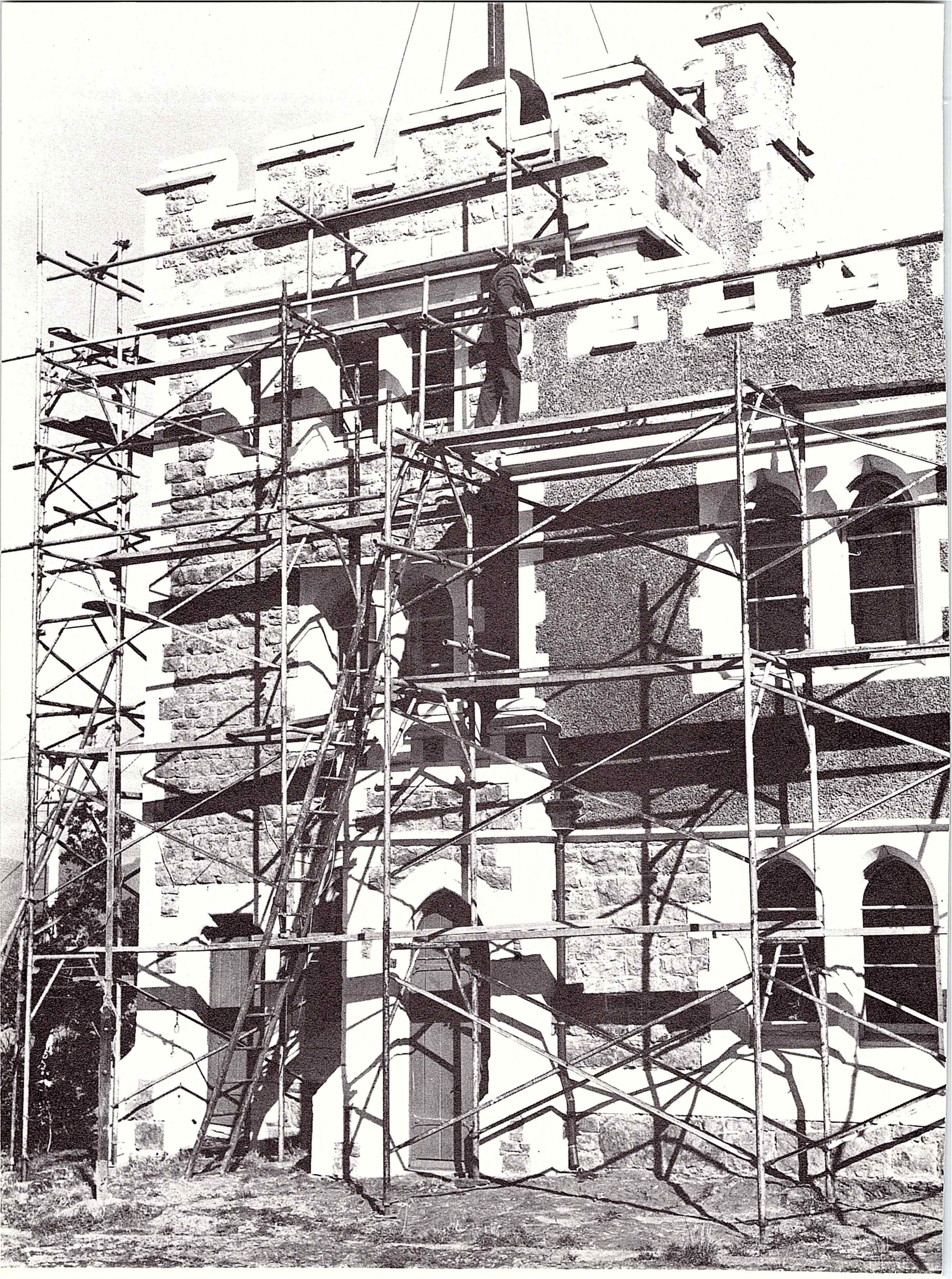
W. H. Scotter, *A History of Port Lyttelton,* 1968.

Indexed notes are deposited with the New Zealand Historic Places Trust, Wellington.

Colourful murals in the watchroom display the history and operation of the station.



When a vital electromagnet was stolen in 1969 this picture of it in a television film enabled a replacement to be made.



APPENDIX I

SOME OTHER SURVIVING TIME-BALLS

Time-balls are listed in order of date built, if known.

Further information about some of these time-balls is available from the New Zealand Historic Places Trust, Wellington.

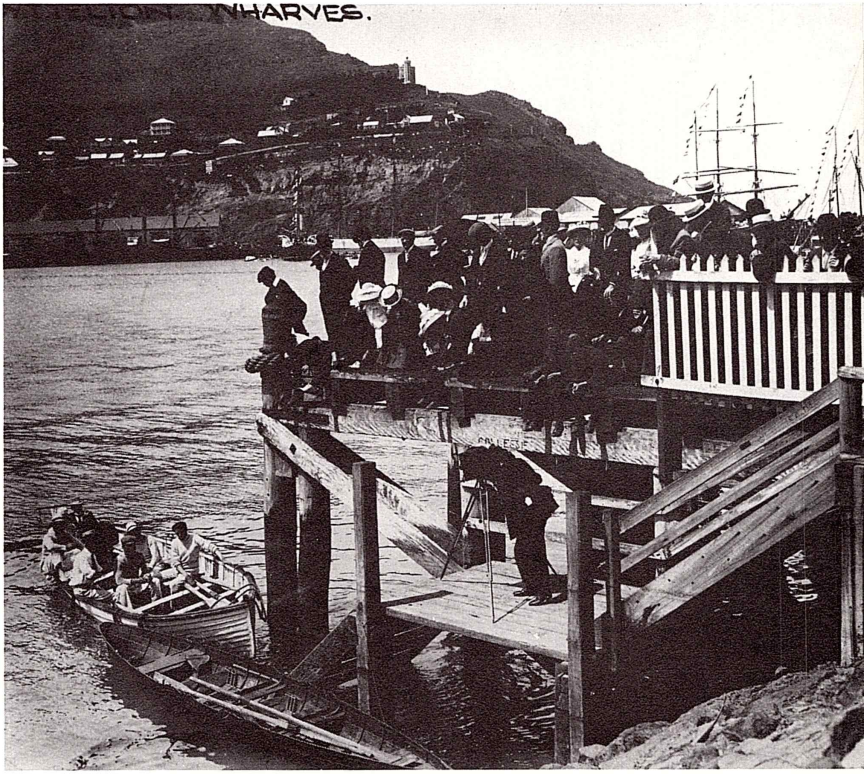
1833	*Greenwich,* England	On Royal Observatory.
1851	*Edinburgh,* Scotland	On Nelson Monument, Calton Hill, by electrical signal from James Ritchie & Sons, clockmakers, Broughton Street, Edinburgh, who still drop the ball manually.
1852	*Williamstown,* Victoria, Australia	Initially on flagstaff but moved to top of lighthouse.
1854	*Deal,* England (to be restored)	On Time-ball Building, Navy Yard—old semaphore station.
1858	*Sydney,* N.S.W., Australia	On Observatory.
1863	*Gothenburg,* Sweden	On Navigation School, Kvarnbergsgatan.
1875	*Adelaide,* South Australia	On Time-ball Tower, Semaphore, Largs Bay. Electric signal from Observatory.
1876	*Lyttelton,* New Zealand	On time-ball tower. Operation restored 1978.
1885	*Washington,* U.S.A.	On State, War & Navy Executive Office Building, 17th Street & Pennsylvania Avenue. Operated manually upon telegraphic signal from the Naval Observatory.
1885	*San Francisco,* U.S.A.	On a castle-like building on Telegraph Hill – probably preceded by an earlier ball on the Old Observatory on Telegraph Hill. Ferry Building 1898. Now aboard *Balclutha* sailing ship museum, near Fisherman's Wharf.

The massive task of removing the damaged 1880 stucco reveals briefly the original stonework.

1894	*Brisbane,* Australia	On Observatory, built as a windmill 1829.
1908	*Hull,* England	On Guildhall, Alfred Gelder Street.
1913	*New York,* U.S.A.	On Seamen's Church Institute, 25 South Street, Titanic Memorial. Telegraph signal from Arlington Observatory, Virginia. Dismantled 1968, re-erected South Street Seaport Museum 1977.
–	*Mystic,* Connecticut, U.S.A.	In the Seaport Museum. Operating 1955-72.

Time signals were not always time-balls: at Amsterdam and Rotterdam there were blades and gongs (discs) which dangled from a cross-arm but fell nevertheless. Captain Lecky lists guns, flags, semaphores, barrels, lights and a steam whistle also serving the same function.

A corner of the livingroom in the time-ball keeper's quarters, now occupied by the custodian. Note the beamed ceiling.



In the 1890s Regatta Days at Lyttelton were great sporting and social occasions.

APPENDIX II

The wonders of a time-ball's electrical system were described in the Wellington newspaper, the *New Zealand Spectator & Cooks Strait Guardian* on 10 February 1864.

The galvanic battery: 'If a plate of copper and one of zinc are placed in a tumbler opposite to one another, having a short length of copper wire fastened to each plate, and if a weak solution of sulphuric acid and water be poured into the tumbler; and if now the ends of the wires be brought into close contact, immediately a current of electricity is put in action, which starts from the zinc plate to the copper plate, returning by the wire to the zinc. If the wires be separated by only a very small interval this electric current is immediately stopped. This is the commonest form of galvanic battery. The battery used for the ball contains 24 such tumblers or cells, placed side by side, for it was found by experiment that two boxes of 12 cells each were needed to generate sufficient electricity.'

The clock: 'The current enters the clock from the bottom, passing out at the top, on its return to the zinc end of the battery. The wire from the battery is broken at this point, and until this break is filled up the action of the battery is checked. At 11 o'clock a peg of steel, upon the hour wheel, touches a small tongue of brass, and the passage for the electric current is advanced one stage. At 1 minute to 12 o'clock, a peg of steel upon the minute wheel, touches a second brass tongue, and another interval of the gap is bridged over. A 12 o'clock, the peg of the seconds wheel touches its brass spring; the break in the wire is filled up, the current of electricity leaps from the copper end of the battery at the rate of 2,000 miles [actually 3,300km] in each second, passing through the clock up to the iron, converting that into a magnet, releasing the trigger, dropping the ball; and having thus well done its work returns to the battery.'

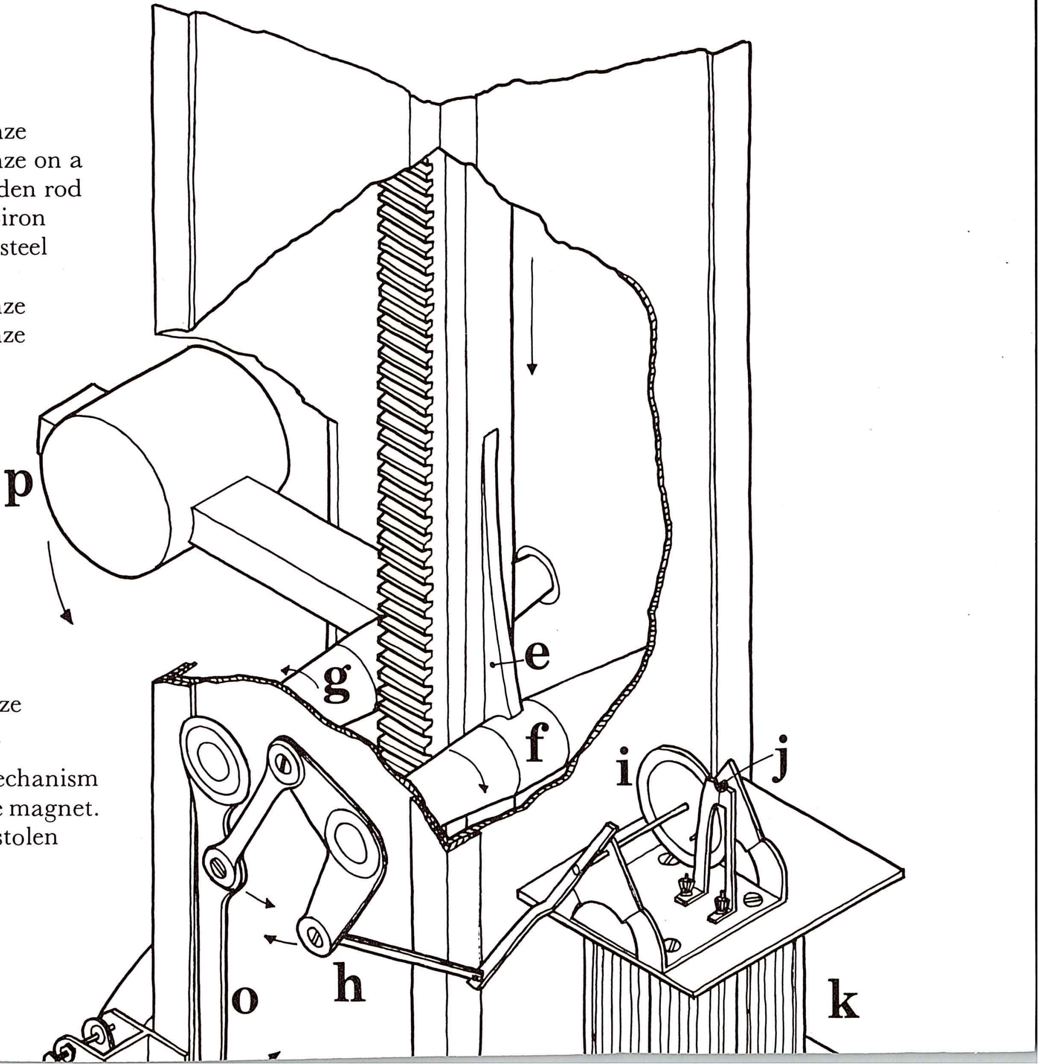
The handsome old fireplace in the sitting-room of the custodian's quarters.

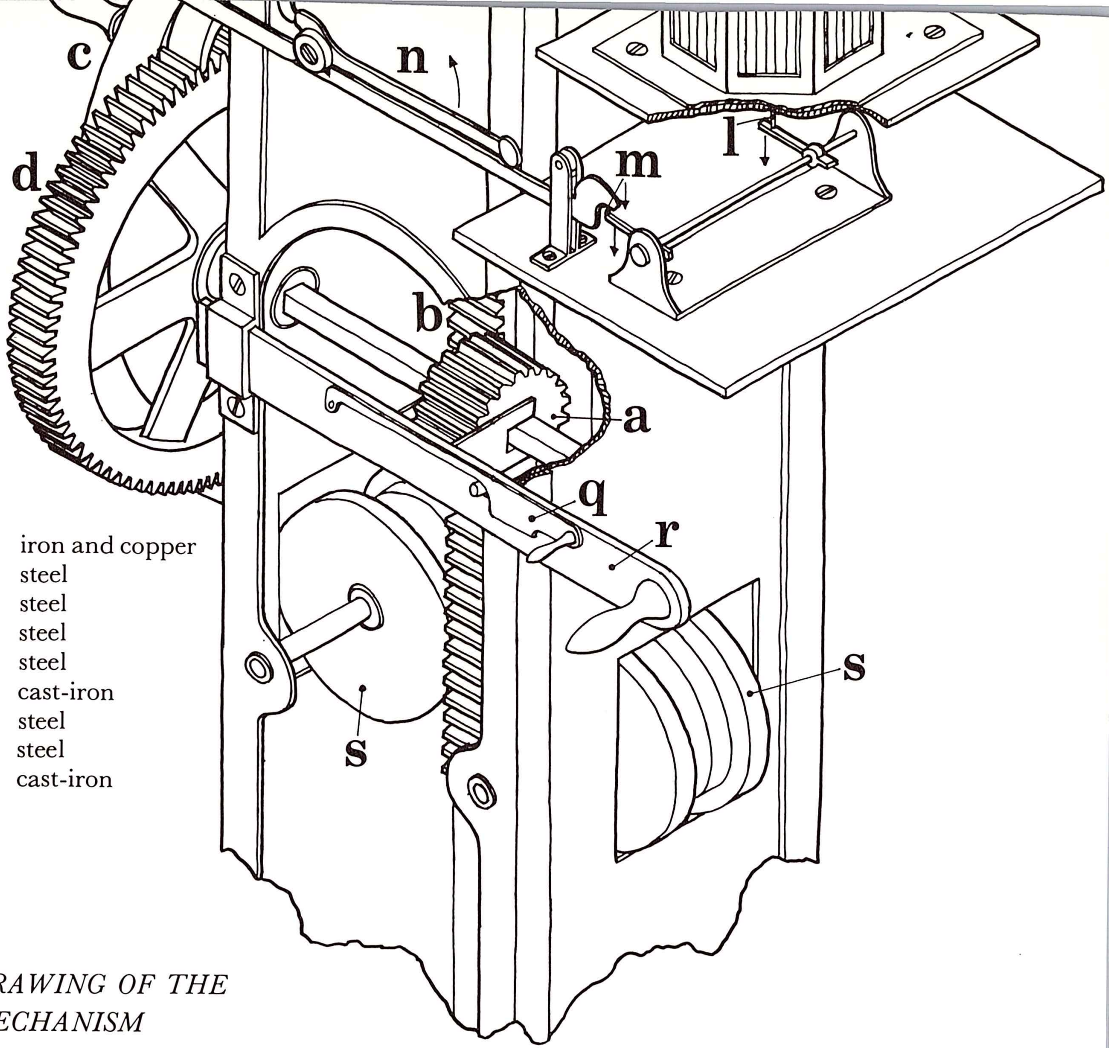
This is not a description of the cells used in Lyttelton which were Mane Davey and needed 'proto sulphate of Mercury'.

A	pinion	bronze
B	rack	bronze on a wooden rod
C	handwheel	cast-iron
D	gear	cast steel
E	catchers	steel
F	roller catch	bronze
G	roller catch	bronze

(H	lever	steel
(I	wheel	bronze
(J	contact	brass

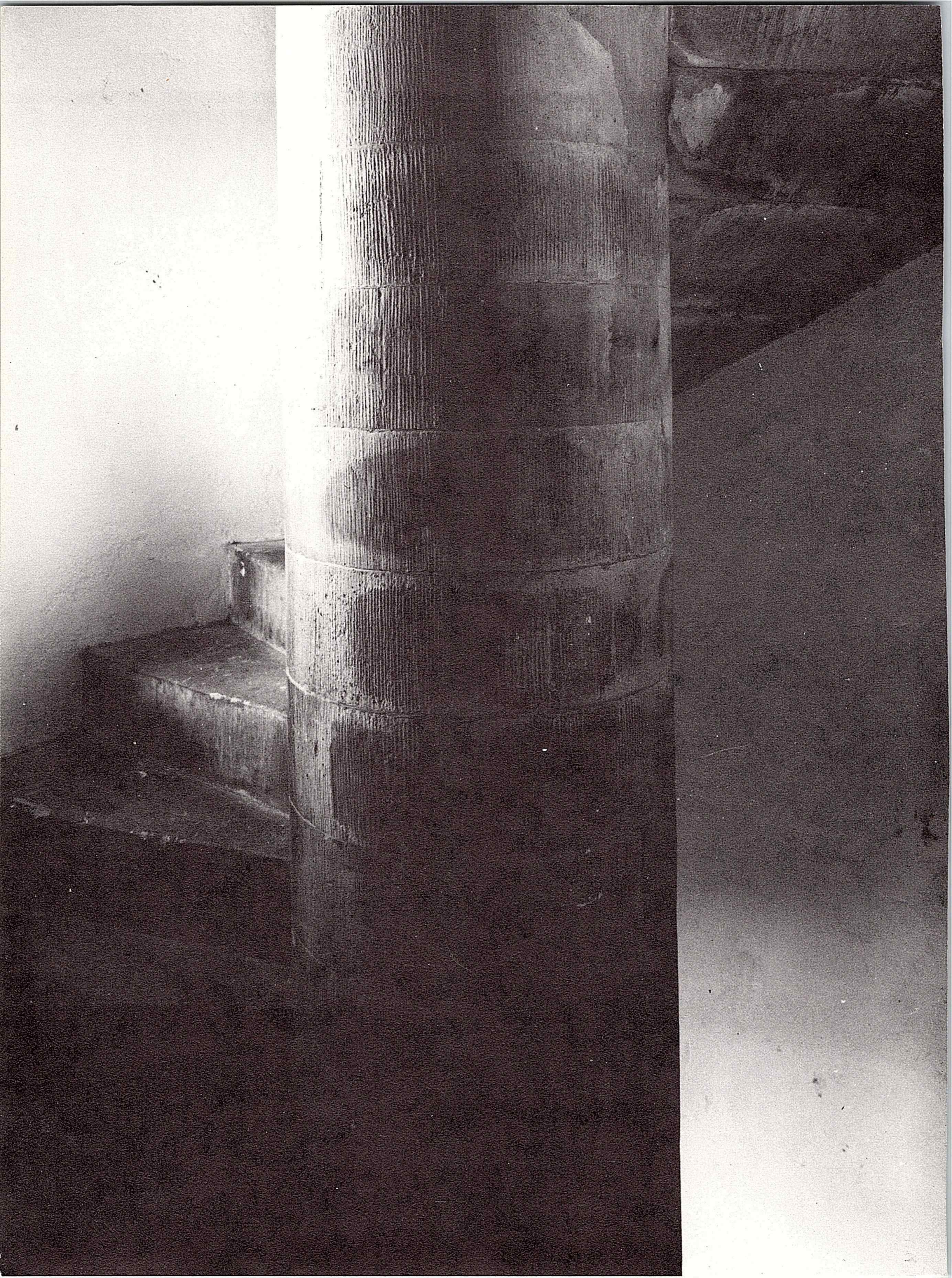
These were in original mechanism to cut off electricity to the magnet. They were subsequently stolen and will not be replaced

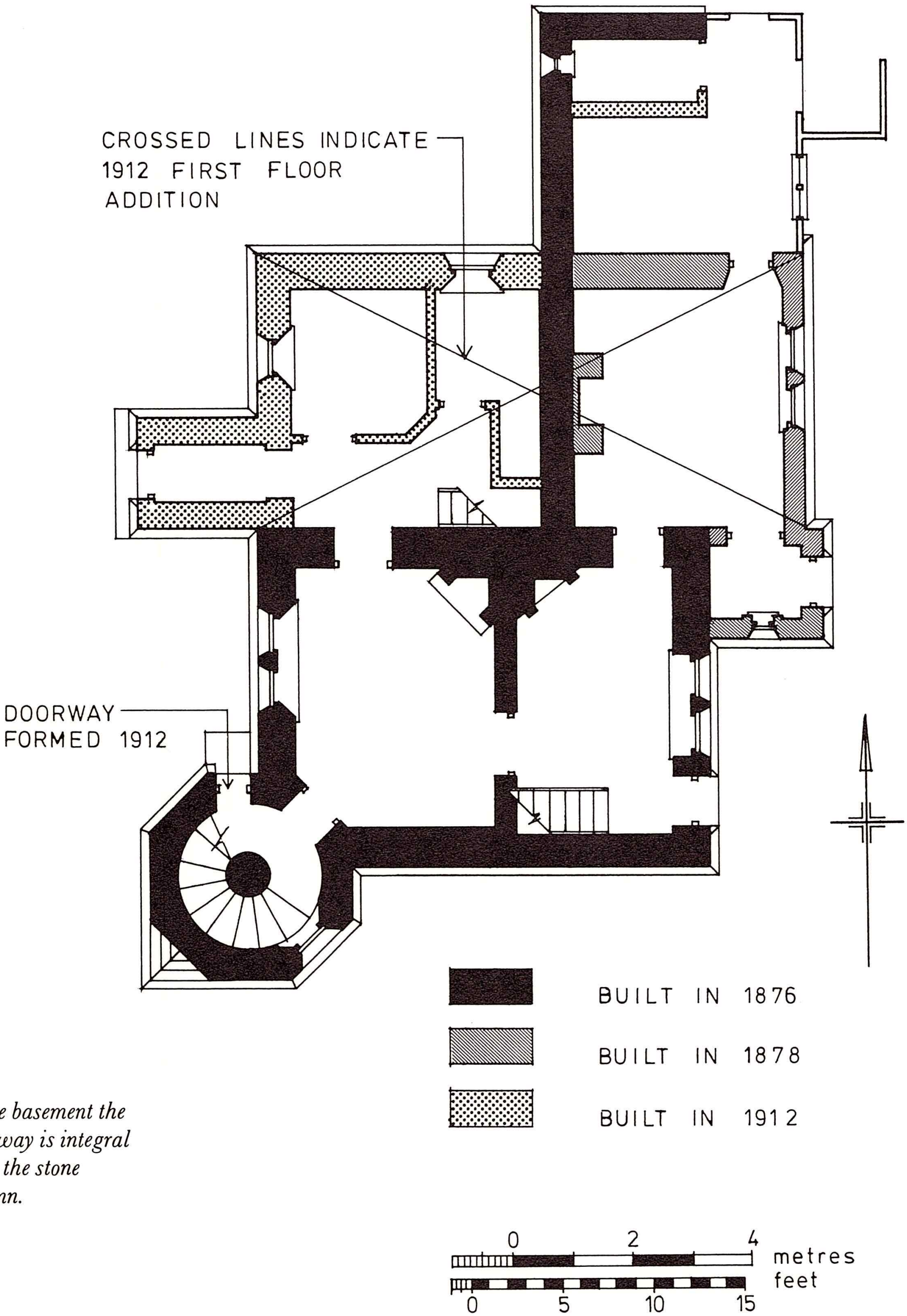




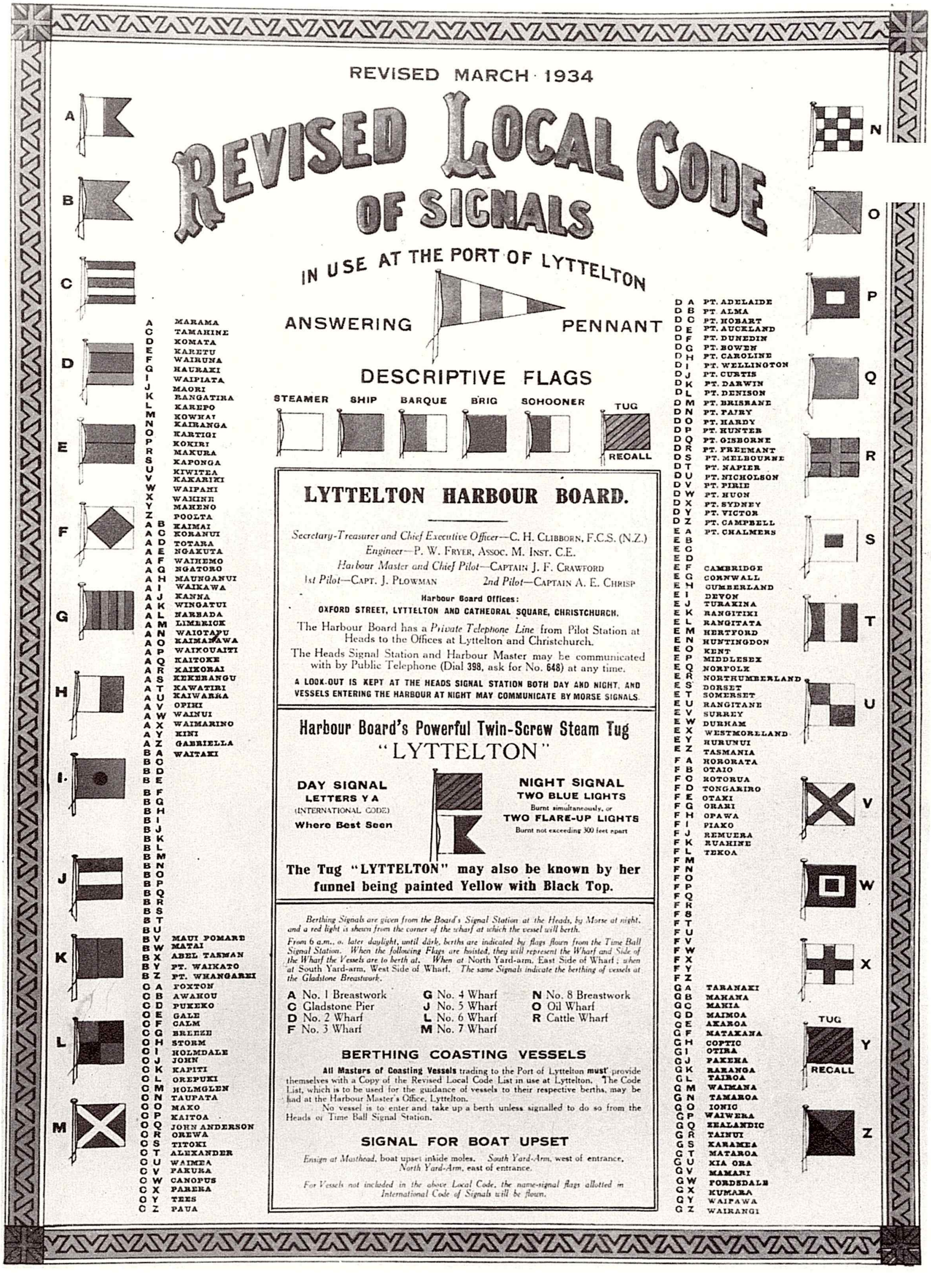
K	electromagnet	iron and copper
L	trip lever	steel
M	trigger	steel
N	trigger lever	steel
O	release lever	steel
P	counter-weight	cast-iron
Q	catch	steel
R	clutch	steel
S	guide rollers	cast-iron

ISOMETRIC DRAWING OF THE
TIME-BALL MECHANISM





In the basement the stairway is integral with the stone column.


A
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REVISED MARCH 1934

REVISED LOCAL CODE OF SIGNALS

IN USE AT THE PORT OF LYTTELTON

ANSWERING PENNANT

DESCRIPTIVE FLAGS

STEAMER SHIP BARQUE BRIG SCHOONER TUG

RECALL

A	MARAMA
C	TAMAHINE
D	KOMATA
E	KARETU
F	WAIRUNA
G	HAURAKI
I	WAIPIATA
J	MAORI
K	RANGATIRA
L	KAREPO
M	KOWHAI
N	KAIRANGA
O	KARTIGI
P	KOKIRI
R	MAKURA
S	KAPONGA
U	KIWITEA
V	KAKARIKI
W	WAIPAHI
X	WAHINE
Y	MAHENO
Z	POOLTA
A B	KAIMAI
A C	KORANUI
A D	TOTARA
A E	NGAKUTA
A F	WAIHEMO
A G	NGATORO
A H	MAUNGANUI
A I	WAIKAWA
A J	KANNA
A K	WINGATUI
A L	NARBADA
A M	LIMERICK
A N	WAIOTAPU
A O	KAIMANAWA
A P	WAIKOUAITI
A Q	KAITOKE
A R	KAIKORAI
A S	KEKERANGU
A T	KAWATIRI
A U	KAIWARRA
A V	OPIHI
A W	WAINUI
A X	WAIMARINO
A Y	KINI
A Z	GABRIELLA
B A	WAITAKI
B C	
B D	
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B J	
B K	
B L	
B M	
B N	
B O	
B P	
B Q	
B R	
B S	
B T	
B U	
B V	MAUI POMARE
B W	MATAI
B X	ABEL TASMAN
B Y	PT. WAIKATO
B Z	PT. WHANGAREI
C A	FOXTON
C B	AWAHOU
C D	PUKEKO
C E	GALE
C F	CALM
C G	BREEZE
C H	STORM
C I	HOLMDALE
C J	JOHN
C K	KAPITI
C L	OREPUKI
C M	HOLMGLEN
C N	TAUPATA
C O	MAKO
C P	KAITOA
C Q	JOHN ANDERSON
C R	OREWA
C S	TITOKI
C T	ALEXANDER
C U	WAIMEA
C V	PAKURA
C W	CANOPUS
C X	PARERA
C Y	TEES
C Z	PAUA

LYTTELTON HARBOUR BOARD.

Secretary-Treasurer and Chief Executive Officer—C. H. Clibborn, F.C.S. (N.Z.)
Engineer—P. W. Fryer, Assoc. M. Inst. C.E.
Harbour Master and Chief Pilot—Captain J. F. Crawford
1st Pilot—Capt. J. Plowman *2nd Pilot*—Captain A. E. Chrisp

Harbour Board Offices:
OXFORD STREET, LYTTELTON AND CATHEDRAL SQUARE, CHRISTCHURCH.

The Harbour Board has a *Private Telephone Line* from Pilot Station at Heads to the Offices at Lyttelton and Christchurch.

The Heads Signal Station and Harbour Master may be communicated with by Public Telephone (Dial 398, ask for No. 648) at any time.

A LOOK-OUT IS KEPT AT THE HEADS SIGNAL STATION BOTH DAY AND NIGHT, AND VESSELS ENTERING THE HARBOUR AT NIGHT MAY COMMUNICATE BY MORSE SIGNALS.

Harbour Board's Powerful Twin-Screw Steam Tug "LYTTELTON"

DAY SIGNAL
LETTERS Y A
(INTERNATIONAL CODE)
Where Best Seen

NIGHT SIGNAL
TWO BLUE LIGHTS
Burnt simultaneously, or
TWO FLARE-UP LIGHTS
Burnt not exceeding 300 feet apart

The Tug "LYTTELTON" may also be known by her funnel being painted Yellow with Black Top.

Berthing Signals are given from the Board's Signal Station at the Heads, by Morse at night, and a red light is shewn from the corner of the wharf at which the vessel will berth.

From 6 a.m., or later daylight, until dark, berths are indicated by flags flown from the Time Ball Signal Station. When the following Flags are hoisted, they will represent the Wharf and Side of the Wharf the Vessels are to berth at. When at North Yard-arm, East Side of Wharf; *when* at South Yard-arm, West Side of Wharf. *The same Signals indicate the berthing of vessels at the Gladstone Breastwork.*

A	No. 1 Breastwork	**G**	No. 4 Wharf	**N**	No. 8 Breastwork
C	Gladstone Pier	**J**	No. 5 Wharf	**O**	Oil Wharf
D	No. 2 Wharf	**L**	No. 6 Wharf	**R**	Cattle Wharf
F	No. 3 Wharf	**M**	No. 7 Wharf		

BERTHING COASTING VESSELS

All Masters of Coasting Vessels trading to the Port of Lyttelton **must** provide themselves with a Copy of the Revised Local Code List in use at Lyttelton. The Code List, which is to be used for the guidance of vessels to their respective berths, may be had at the Harbour Master's Office, Lyttelton.

No vessel is to enter and take up a berth unless signalled to do so from the Heads or Time Ball Signal Station.

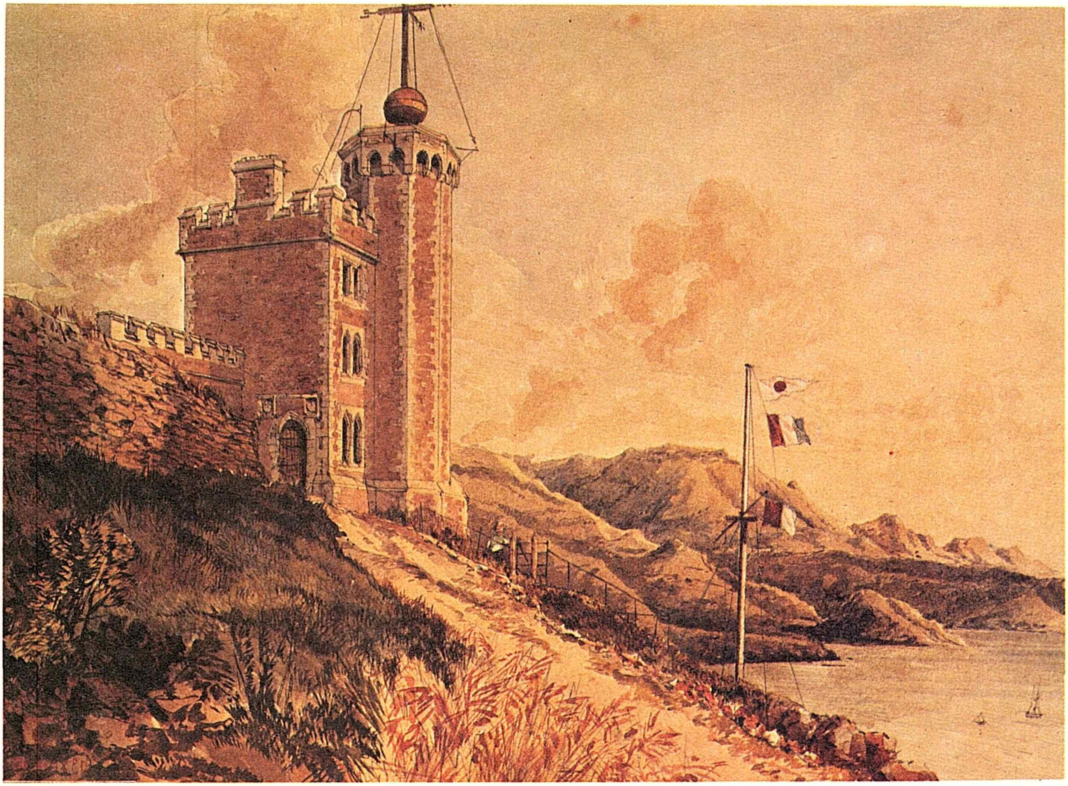
SIGNAL FOR BOAT UPSET

Ensign at Masthead, boat upset inside moles. *South Yard-Arm*, west of entrance. *North Yard-Arm*, east of entrance.

For Vessels not included in the above Local Code, the name-signal flags allotted in International Code of Signals will be flown.

D A	PT. ADELAIDE
D B	PT. ALMA
D C	PT. HOBART
D E	PT. AUCKLAND
D F	PT. DUNEDIN
D G	PT. BOWEN
D H	PT. CAROLINE
D I	PT. WELLINGTON
D J	PT. CURTIS
D K	PT. DARWIN
D L	PT. DENISON
D M	PT. BRISBANE
D N	PT. FAIRY
D O	PT. HARDY
D P	PT. HUNTER
D Q	PT. GISBORNE
D R	PT. FREEMANT
D S	PT. MELBOURNE
D T	PT. NAPIER
D U	PT. NICHOLSON
D V	PT. PIRIE
D W	PT. HUON
D X	PT. SYDNEY
D Y	PT. VICTOR
D Z	PT. CAMPBELL
E A	PT. CHALMERS
E B	
E C	
E D	
E F	CAMBRIDGE
E G	CORNWALL
E H	CUMBERLAND
E I	DEVON
E J	TURAKINA
E K	RANGITIKI
E L	RANGITATA
E M	HERTFORD
E N	HUNTINGDON
E O	KENT
E P	MIDDLESEX
E Q	NORFOLK
E R	NORTHUMBERLAND
E S	DORSET
E T	SOMERSET
E U	RANGITANE
E V	SURREY
E W	DURHAM
E X	WESTMORELLAND
E Y	HURUNUI
E Z	TASMANIA
F A	HORORATA
F B	OTAIO
F C	ROTORUA
F D	TONGARIRO
F E	OTAKI
F G	ORARI
F H	OPAWA
F I	PIAKO
F J	REMUERA
F K	RUAHINE
F L	TEKOA
F M	
F N	
F O	
F P	
F Q	
F R	
F S	
F T	
F U	
F V	
F W	
F X	
F Y	
F Z	
G A	TARANAKI
G B	MAHANA
G C	MAKIA
G D	MAIMOA
G E	AKAROA
G F	MATAKANA
G H	COPTIC
G I	OTIRA
G J	PAKEHA
G K	RARANGA
G L	TAIROA
G M	WAIMANA
G N	TAMAROA
G O	IONIC
G P	WAIWERA
G Q	ZEALANDIC
G R	TAINUI
G S	KARAMEA
G T	MATAROA
G U	KIA ORA
G V	MAMARI
G W	FORDSDALE
G X	KUMARA
G Y	WAIPAWA
G Z	WAIRANGI

TUG
RECALL



The Lyttelton time-ball station in 1880, a watercolour painted by the first architect, Thomas Cane, and commissioned by the Provincial Secretary, Henry Webb.

PRINTED AT THE PEGASUS PRESS

The
LYTTELTON
TIME-BALL
STATION

An Account of its History, Operation and Restoration

NEW ZEALAND
HISTORIC PLACES
TRUST